

Radio Control

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TOP 10 ISSUE!

CAR ACTION

THE WORLD'S LEADING R/C CAR MAGAZINE

May 1994

POWER
PLAY

Associated's New
RC10GT Gas Truck
Hits the Track

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10 easy
layouts

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Inside the world's
fastest R/C car

Double-X
vs.
Pro SE
Which
rules?



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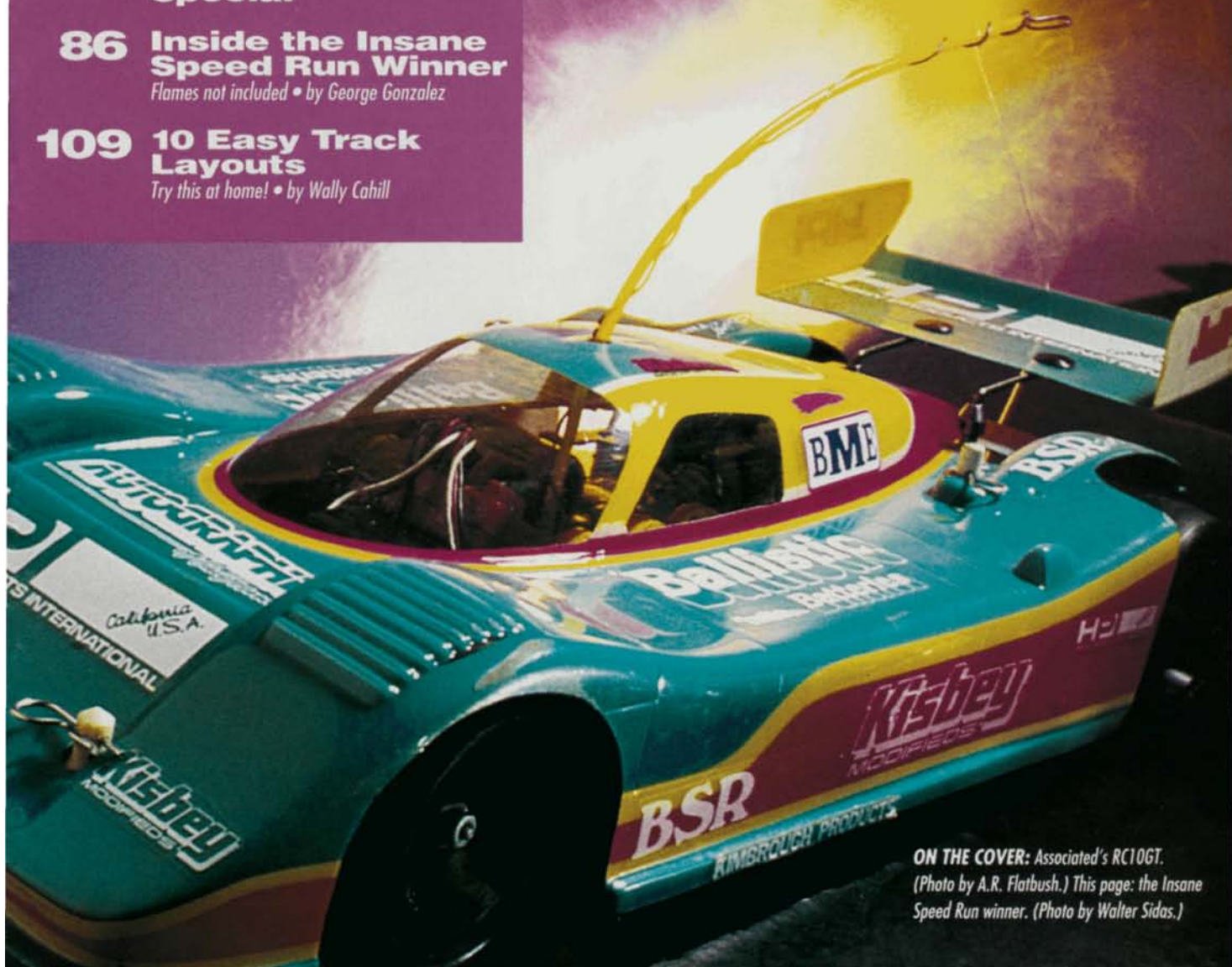
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ON THE COVER: Associated's RC10GT.
(Photo by A.R. Flatbush.) This page: the Insane
Speed Run winner. (Photo by Walter Sidas.)

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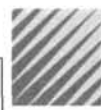
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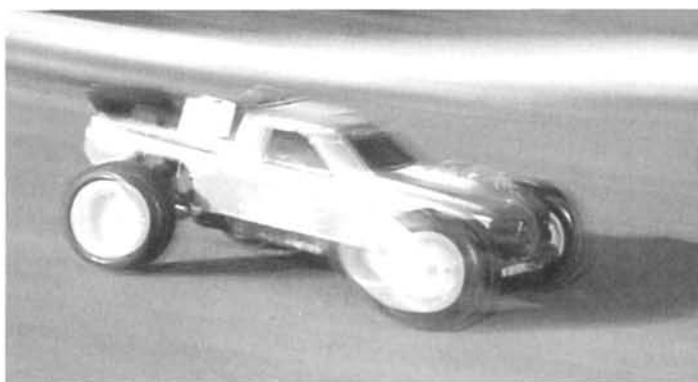


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EDITORIAL



Take the Top 10 Challenge

It's that time again—time to publish the always demanding Top 10 issue. Some of our picks may not be the same as yours, but then again, whoever said pleasing everyone was easy?

To help you understand our dilemma, I thought it would be a good idea to share with you the process by which we choose our Top 10 winners. First, we draft a rough list of categories, for example, Top 10 Cars. Next, we divide the main category into 10 sub-categories: 1/10-scale off-road, 1/8 gas, etc. From this point, the entire editorial staff makes a list of their particular candidates for each sub-category.

The ensuing discussion (or, in some cases, arguments) can be quite heated, with every editor pushing for his or her favorites. Each candidate for Top 10 is judged according to several criteria. For example, if a racing car is to make our list, it must have a pretty impressive record of wins, or be blazing the track on the local level.

In making the Top 10 selections, objectivity is vital. The primary rule of journalism is to be unbiased—easier said than done. All *Car Action's* editorial staff have preferences when it comes to our hobby. I, for example, may like off-road, while another staffer is more interested in on-road. When it's time to vote, it's really tough to put aside your likes and dislikes in the name of objectivity, but we must do it!

Finally, there's the time in which we choose the Top 10 winners. I'm writing this, it's January, and there's snow on the ground, but you won't see this issue until April! Between now and then, there may be new cars and products even more deserving of a place on our list. This is often the case, but—sorry—there's nothing we can do about this (unless you know of a really accurate psychic!).

True, it's a lot of work to choose the Top 10, but we feel it's time well spent. Part of *Car Action's* purpose is to impart the benefits of its editors' experiences to the readers, and, in doing so, help you to make better, more informed purchasing decisions that will eventually lead to increased enjoyment of your hobby.

LETTERS

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.

would even work for R/C application—the alternator would hinder performance. Buy rechargeable Ni-Cds for your receiver pack, and you'll be all set. JH

ANDRETTI'S RIDE?

I read the article "Parking Lot Racing Lives in California" in "Inside Scoop" [*R/C Car Action*, September '93]. I read your earlier article on the Kyosho Jordan Yamaha F1 and have become interested in F1 racing. Is the F1 McLaren Andretti Honda a new Kyosho kit, or did the owner just do an excellent customizing job? In the same issue, I saw an ad from Stormer Racing that offered a Kyosho McLaren F1 (stock no. KYO4202) for \$99.99. Is this the same car pictured in your parking lot racing article? If it is, do you have any information on it? I'm thoroughly confused.

JONATHAN LOO
Whiteland, IN

Well, Jonathan, I'm not sure whether the car is a Tamiya or a Kyosho, but it definitely has a cool custom Andretti look, doesn't it? I looked into your question, and the Kyosho McLaren Honda that you saw in the Stormer ad is an old car that has been discontinued. The car isn't at all like the current crop of F1s that are popping up; it's an older, heavier, quite complicated design that has a gearbox. It looks really scale, and if that's all you're looking for, then give it a shot. But I've been told that the difference in performance between the two is actually quite noticeable. If you're interested in parking lot racing, stick with one of the newer Kyosho or Tamiya F1 cars. JH

GIT YOUR MOTOR RUNNIN'

I'm thinking about buying a Kyosho Raider or a Tamiya Super G. Are they good for a first-time builder? Will I be able to drive them? Do you think I'm ready for either of them? I've owned five Tyco cars, and I liked them.

BARRY BODINE
Washington Township, NJ

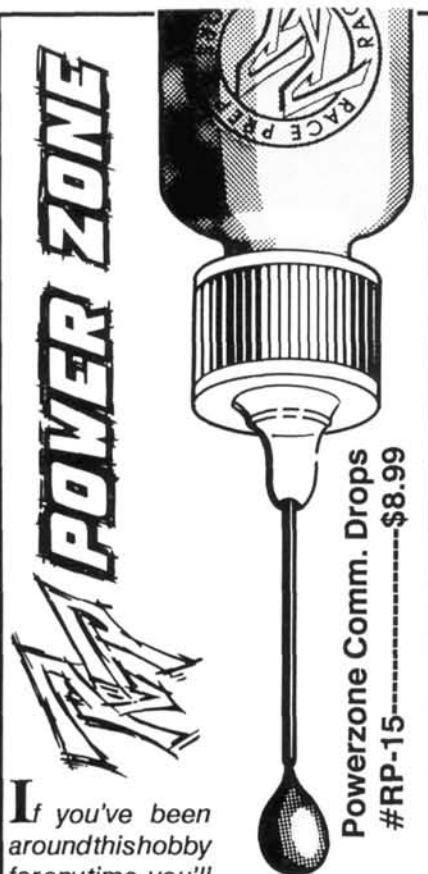
WARP SPEED MR. SCOTT

I purchased a Traxxas Nitro Hawk that came assembled, with a .12 Image gas engine. I'd like to know if it's possible to mount a .21 gas engine on it. I've seen .15 engines on a 1/10-scale car, but I'd like to go farther and add a .21. I know that I might have to change the layout on the chassis (I hope not). I was looking at a Magnum .21b. I don't mind if it puts out as much as most .21 engines because it will be fast anyway, but is this a good engine to go with? Keep up those gas-car specials and "Troubleshooting"; they really pulled me out of errors. Why don't gas engines come with an alternator to charge the batteries on board?

MICHAEL MORRIS
Tuckerton, NJ

Whoa, Michael, you had better hold off on those plans. In your letter, you stated that our gas-car specials and "Troubleshooting" have kept you out of trouble. Well, trust me, a .21 engine is waaaay too much horsepower to toss into your Nitro Hawk. No way will you be able to put the power to the ground. Have you ever seen 1/8-scale buggies run? They have a ton of power, and they weigh more than 7 pounds! Your Nitro Hawk weighs only around 4 pounds. Also, if you could fit the engine in your truck, there's a big chance that your tranny might not be able to take the power of a .21. If you're looking to get more power out of your Traxxas Image .12, contact Dart Racing at 11999 Plano Rd., #140, Dallas, TX 75243. Good luck with your quest for more speed.

As for an onboard alternator, well, it's time for my bad George Bush impression: not gonna happen, not at this juncture, wouldn't be prudent. Really, though, it wouldn't be very practical. With the added weight of a recharging system—if it



If you've been around this hobby for any time, you'll know that the Race Prep Silver "R" Compound Motor Brush is the best. Now you can make it better with the new Powerzone Comm. Drops. One drop per run is all it takes to increase power up to 20%. No other comm. drop last like ours - over six minutes! Will not glaze the commutator and eliminates carbon deposits. The motor runs cooler, more efficient, more RPM, more torque, which equals more power! One bottle lasts for over 1000 runs. Who wouldn't pay under a penny per run for this kind of performance? The Powerzone Comm. Drops work great on any motor or brush. Why pay more when you can get the best for less?



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(602) 636-1955 Fax (602) 636-1956

Yeah, Barry, I think you'll be able to deal with building either of these cars. Kyosho and Tamiya are well-known for designing easy-to-build entry-level cars, so you shouldn't have a problem. But just for your information, the Tamiya Super G has been discontinued, and if you're interested, Tamiya offers a whole slew of entry-level cars and trucks for on- and off-road.

On another note, unfortunately, I'm not too familiar with Tyco's lineup of RIC cars, but I think they all come with everything you need to get them running out of the box, i.e., a radio, a charger and a battery for the car. If you get either the Tamiya or Kyosho, you'll have to buy all that other stuff separately. It might sound like a lot of cash to part with at first, but the quality and versatility of these kits are well worth the investment. JH

THE LEXAN LAMBADA

I enjoy reading your magazine very much, and I buy it the day it hits the stands. (Unfortunately, it's often sold out.) What's the easiest way to cut the wheel wells out of a Lexan body? Often, just the slightest "miscut" can mess up the whole body, and the cost of these bodies really starts to add up. Is there a special tool for this? Thanks a lot, and keep up the good work!

JOEY YAKUBIK
Henderson, NV

Give Tamiya or Kyosho a call, Joey; they both manufacture special scissors for cutting Lexan. I've used them a million times, and they work well. Another option you might want to check out is the Slingshot Lexan cutting tool produced by Kurtis Mfg. in Denver, CO. The Slingshot (yes, it looks like a slingshot) is made of fiberglass, powered by two C-cell batteries and has a metal wire-cutting filament that heats up to cut the Lexan. Its on switch has a guard for safety. It retails for \$19.95. You can get the Slingshot from Mike Ramsey at Kurtis Mfg., 2301 W. 44th Ave., Denver, CO 80211; (303) 477-8250. JH

(Continued on page 154)



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Team NOVAK TEAM SECRETS

ELECTRIC OR GAS?

Confused by the hype about the new gas cars, trucks and buggies? **Well, you're not alone!** Here are a few tips that get to the bottom line.

An electric car is easy to operate. Charge up the pack, plug it in, and **have fun**. Reliable electronic speed controls, durable matched batteries, and purpose-built electric motors make electric set-ups last for a long time without maintenance or adjustments.

Gas is a different beast. Gas engines are more complex. To keep them running, you must pay careful attention to the engine temperature, fuel, carburetor, glow plug, air filter, and servo linkage for the throttle and brake.

The rumble of a gas car **sounds** cool—but what about the **mess**? Go to a gas race to see what happens when you mix gas and dirt. With an electric car, clean-up is easy, you can run indoors **and** outdoors, and your neighbors won't complain about noise.

What about speed? On most tracks, an electric 1/10th truck will give a gas 1/10th truck a good battle. The electric will have slightly quicker acceleration and the gas slightly higher top speed. Lap times are usually very close.

Bang for the buck? Add up all of the costs and you'll see that electrics are less expensive. Electric drive systems only have three components—a motor, battery pack, and speed control. Gas drive systems require more stuff—an engine, muffler, clutch, throttle servo, disc brake, air filter, carburetor, gas tank, receiver battery pack, and a starter. Even with a quality Novak DIGI-PEAK charger, some spare motors and extra battery packs, **electric is still less expensive.**

Of course, there is a time and place for gas racing. If you're an experienced R/C veteran looking for a change of pace, check out a gas race. But don't forget to look at the **total picture**. Electrics are more reliable, cheaper, and faster than ever. For the beginner and intermediate R/C driver, it's no contest—**choose electric first!** For more info on R/C, see your local hobby dealer.

Team Novak welcomes your comments and secrets!

NOVAK ELECTRONICS, INC.
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WHAT'S NEW



RPM Wheel and Shock Nut Wrench

One end of this small, double-ended spanner-type socket wrench is designed for the 3/8-inch wheel nuts on Losi cars and trucks; the other end can be used on the 1/4-inch nylon nuts on the upper shock mounts.

Part no.—7093; price—\$4.95.

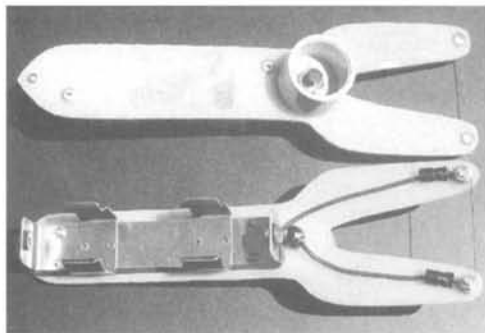
RPM, 14978 Sierra Bonita Ln., Chino, CA 91710; (909) 393-0366.

KURTIS MFG. Slingshot R/C Body Trimmer

This battery-operated cutting tool glides through bodies with the ease and control that you've been waiting for. Trim your R/C body in 10 to 15 minutes without worrying about "miscuts" that could become huge cracks during impacts. The Slingshot uses two alkaline or Ni-Cd C-cell batteries (not included), and it comes with an extra filament, sandpaper and complete instructions.

Part no.—KMI 001; price—\$19.95.

Kurtis Mfg. Inc., 2301 W. 44th Ave., Denver, CO 80211; (303) 477-9692.



TAMIYA Spray-Work HG Airbrush

This new airbrush has all the features that expert modelers want most, including chromed-brass-and-steel construction, drop-feed design, an adjustable needle stopper, a 0.3mm nozzle and a 7cc paint



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Part no.—74503.

Tamiya America Inc., 2 Orion, Aliso Viejo, CA 92656; (714) 362-2240.



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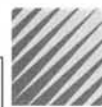
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WHAT'S NEW



ALPINE MOTORSPORTS Bergonzoni Engines

Alpine Motorsports is the source of the world-famous Bergonzoni engines, and these are two of the finest! The high-performance Radial-

Head Club .21 racing engine is perfect for most 1/8-scale gas cars and it has a convenient pull-starter. The Mirage 6-Port is a full-race, ultra-high-performance powerhouse for serious world-class competitors! Both are of the high quality that has made Bergonzoni the choice of racers all over the world. For more information, contact Ken Krader at:

Alpine Motorsports, (714) 693-2930; fax (714) 693-2915.

DAHM'S

Slammer XL

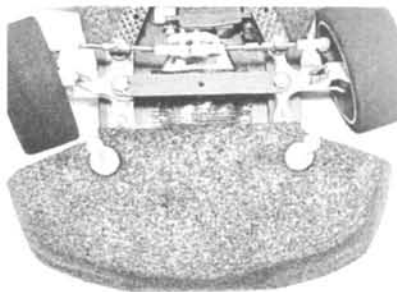
Dahm's Slammer XL body was designed to be the lightest, lowest, best-looking, most aerodynamic stadium race truck body for the LX-T, the Blue Eagle, the LS-II,



the Nitro Hawk, the RC10T, the Ultima Outlaw, the Outlaw Rampage and the Stadium Blitzter. Made of high-quality Lexan, the Slammer XL improves handling at high speeds, it uses the stock body mounts, and it can be attached to the frame sides of the trucks with Velcro®-brand fastener. The Slammer XL features fine detailing, a hood scoop for shock clearance, a sun-roof/escape hatch, double roll bars, optional large number plates, extra-large rear cooling vents, complete instructions and Dahm's truck grill/taillights decals.

Part no.—D040; price—\$19.98.

Dahm's Racing Bodies, P.O. Box 360, Cotati, CA 94931; (707) 792-1316.



T.D. ENTERPRISES Protector/PT

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win if you don't finish! It's available at your hobby shop, or contact:

T.D. Enterprises, P.O. Box 3301, Lexington, OH 44904; (419) 884-2004.

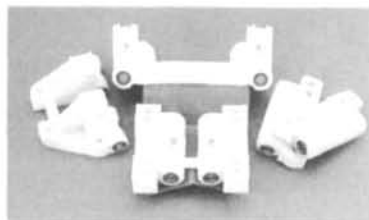
QUARTER FLASH MOTORS

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Eliminate suspension binding and take seconds off your lap times with QFM's Ultra Suspension Components. Designed to replace the front and rear suspension-arm mounts of the RC10 buggy and RC10T truck, these mounts have ball bearings in which the hinge pins fit for smooth, slop-free operation. Wipe out reaming, polishing and slop, and wipe out the competition!

Prices—\$19.95 each (front mounts or rear-arm mounts with 1.5 or 3 degrees of rear toe-in).

Quarter Flash Motors, 16301 S. Santa Rita, #C, Sahuarita, AZ 85629; (602) 625-9274.



HITEC

SP-560 Power Speed Controller

This upgraded version of Hitec's SP-520 Plus has the same Polarity Protection Circuit, which will protect the circuits from being destroyed, even if you accidentally connect the battery backwards. The green heat sinks attached to the Mosfets use a revolutionary heat-conductive sil-

icone that's molded to fit perfectly. It also has Tempfet protection against heat build-up, and that acts as a circuit breaker, cutting off the system temporarily and resuming operation when it has cooled down. Maximum current is 800A; continuous is 200A; current drain is 0.007 ohm. The controller has a 5.6V BEC, it measures 1.77x2.16x0.78 inches, and it weighs 2.6 ounces.

Part no.—HSP0560; **price**—\$99.95.

Hitec RCD Inc., 10729 Wheatlands Ave., Ste. C, Santee, CA 92071; (619) 449-1002.

M.M. NEWMAN CORP.

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This highly efficient miniature soldering iron accommodates a wide variety of tips. Its pencil-thin handle allows precise control, and its heating element is directly under the tip for optimum thermal efficiency. It heats up to 700 degrees F, and it's ready to solder in 45 seconds. Available tips include a conventional spade, a chisel, a stubby, a needle, a pyramid, a cone and the hot knife. They're all made of a special copper alloy that heats up and recovers rapidly, and their nickel plating allows easy wetting.

Price—\$19.95 (includes a standard tip).

M.M. Newman Corp., 24 Tioga Way, P.O. Box 615, Marblehead, MA 01945; (617) 631-8887.



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TRINITY Evolution 10

MAGIC TRICKS

by Joel "Magic" Johnson®
IFMAR World Champion

Do you want to improve the performance of your Evolution 10ss on any oval for the upcoming 1994 season? Then Trinity's new LSD™ (left-side drive) conversion kit should be your next update to your EV10ss. This conversion kit includes everything needed to give your EV10ss the same winning edge that I used to capture the 1993 PROCAR World Championship in King, NC. Included in the kit are all the necessary components for the conversion, such as new graphite top and bottom plates for the rear pod, an aircraft-aluminum left-side motor mount, a new left-side diff hub and a new LSD™ solid graphite axle.

The new graphite pod upper and lower plates (EV6004, \$12.99; EV6005, \$15.99) and motor mounts (EV0063, \$14.99) enable the motor to be mounted on the left side of the car for more static weight on the left rear tire. This static weight on the left rear gives the EV10ss LSD™ unbelievable drive out of the turns on any surface. The Left Side Drive™ also helps the car enter the turn faster. This is ideal for small ovals on any surface, or any large ovals that have less than ideal traction conditions.

Along with the rear motor mounting accessories, we have also included a new axle and left side diff hub to make the rear track spacing correct. The new axle (EV6010, \$22.99) is Trinity's new solid graphite design. This is to give the axle superior strength over the hollow axle without much weight penalty. Along with being able to withstand more punishment than the hollow axles, this solid axle will also not bend or deflect as much under hard acceleration. To go with the new axle is our new LSD™ left drive hub (EV6011, \$13.99), which puts the differential on the left side of the car. Here again, the weight is being shifted to the left side of the car, which is exactly where you want it. This hub is made of high-grade aircraft aluminum and is CNC-machined to ensure a very light weight and true spinning hub.

If you are serious about oval racing in 1994, the Trinity LSD™ conversion for the Evolution® 10ss is for you. Part no. EV0014, \$85.99.

Joel "Magic" Johnson,
Trinity R&D

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INSIDE SCOOP

by CHRIS CHIANELLI



IN SEARCH OF FUN AND GLORY, 'CAUSE LIFE'S TOO SHORT TO BE CHEAP!

Longtime Associated driver and off-road world champion Brian Kinwald has shocked the racing fraternity with a recent announcement: he's leaving Associated and joining the Trinity/Losi race team. Brian will run Trinity Motors, batteries and on-road cars while moving to the innovative Losi Double-X off-road machine. During a recent conversation, "Pops" Losi told me, "We're very excited to have Brian, not only because of his vast talents, but to further the cause of our R&D team—something Losi takes great pride in." For those who are wondering whether this is going to be a "move over Magic" situation, forget it. The Magic Man put it best: "With the very different strengths the two of us have, this can only serve as a union that will make us both better, more versatile competitors." Spoken like a true sportsman. So what did his eminence (Ernie Provetti) have to add? Just this: "I've got the best of both worlds under one roof, right here in Motor City! Yeah, rock it out!" Spoken like the "Penske" of R/C racing.

THE CHAMP MAKES A MOVE



The great-looking stadium-truck body and scale wheels and tires add to the fun. Look for more on this truck in an upcoming issue.

Desert Racing Truck

TAMIYA

Remember our "New for '94" feature back in February's issue? Remember that cool Tamiya Mickey Thompson Grand Prix Chevy truck? Of course you do! Well, I thought it was worth a closer, "body-off" look, so here it is.

The truck is based on Tamiya's 4WD Sedan/Rally chassis. It features full-time, shaft-driven 4WD with an adjustable ball diff in the back and a bevel-gear diff up front. Its 4W independent suspension is damped by large-volume, oil-filled coil-over shocks, so it should be able to handle the hairiest of stadium jumps!





Bavarian Hot Rod

Parma/PSE has done a fantastic job with this German GTD racer. This highly detailed, accurately sculptured BMW 325i is specifically designed for the Tamiya shaft-drive, 4WD, on-road chassis. List price is \$19. The 1/10-scale yuppie couple is sold separately. Look for more 1/10-scale sedans from Parma/PSE soon.



Just when you thought you were high-tech because you put foam inside your tires, you found out that the pros are still one step ahead of you; they cut their foam inserts so that they better conform to the inside shape of the tire! Apparently, this lets the foam provide more even support to the tire's shape. Well, Yokomo has just shown us their new, pre-contoured foam inserts for all popular off-road tires and wheels. The inserts are available in narrow or wide widths to fit both front and rear tires, and you have your choice of soft or firm foam. Part numbers ZC-TFS (front soft); ZC-TFH (front hard); ZC-TRS (rear soft); and ZC-TRH (rear hard).

YOKO-FOAM

Zero Gravity™ Pinions

Trinity Pinions...Ours are precision machined from 6061 T-6 aircraft aluminum and teflon impregnated for smooth meshing and minimum friction.

Brand "R"...They have poor tooth finish and profile. They don't mesh well with the spur gear.

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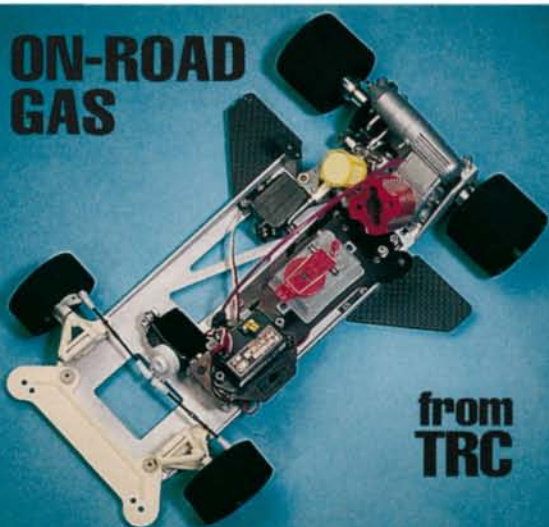
the Sting, PART THREE



Using a tuned pipe is the easiest way to squeeze more power from your engine. Adding MIP's new, purple-anodized Stinger exhaust pipe and 360-degree header to your Traxxas Nitro Hawk or Associated RC10GT will add horsepower and improve your truck's appearance. If you have an O.S. CZ-R .12, a Dynamite TNT/Prafa, a Yokomo .12, or an Image .12 engine, you can bolt the MIP pipe and header right onto your engine's exhaust port.

MIP president Eustace Moore, a talented racer himself, and MIP team driver B.J. Christensen have been extensively testing and racing the Stinger on their prototype Nitro Hawks with great success. Look for more gas-racing goodies from MIP soon!

ON-ROAD GAS



from
TRC

TRC, the tire tyrants, have announced plans to enter the gas-car market. Shown here is the company's as-yet-unnamed, gas on-road racer. The car is built around a channeled, aluminum chassis that looks plenty tough, and it relies on a floating rear-pod suspension to keep things in line. Up front, the TRC car uses Associated's LS front suspension; this allows you to set caster and camber for on-track versatility. Just a guess, but I think that this car might come with TRC tires and wheels. Gee, what do you think?

GET A GRIP.

Gettin' sideways is cool if you're running dirt oval, but if you're racing on carpet or asphalt, it doesn't cut it!

To improve foam tire performance on hard surface tracks, the race team worked with the chemical engineers at Trinity to develop Zip Grip™, a custom, hand blended R/C foam tire traction compound.

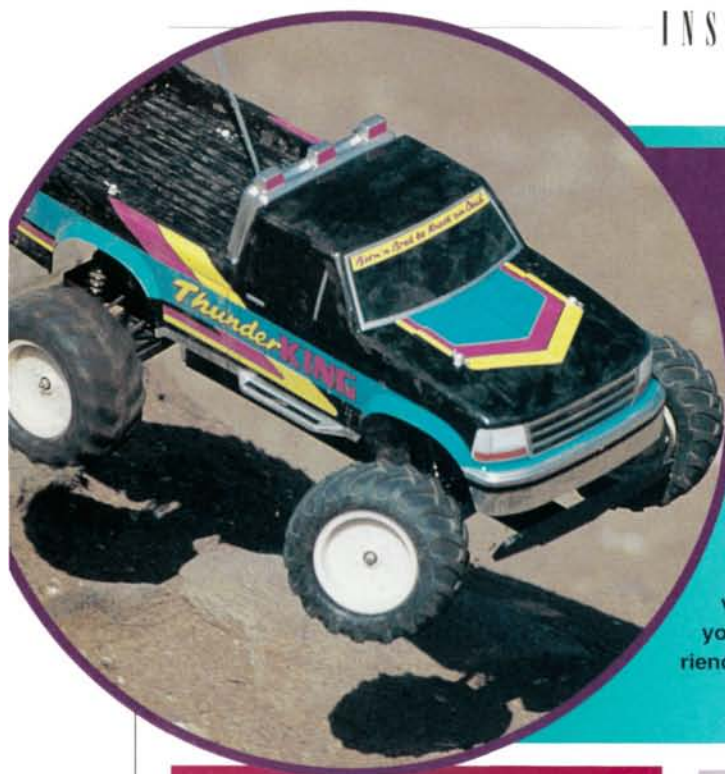
Using Zip Grip provides the most precise and repeatable tire performance on carpet or asphalt R/C racing tracks, of any formula available today. And, the new style applicator keeps the Zip Grip on your tires and off your hands.

So if you've been getting entirely too familiar with the turn marshals, it's time to "get a grip" with Zip Grip!

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THUNDER King BBX

If you've been thinking about getting into World Scale big-time handling and realism, now is the time to make the move! The list of features on this new, all-bushing Thunder King BBX is too long to list here, but here's a sample: adjustable ball differential; oversize, aluminum, oil-filled shocks; adjustable coil springs; Power Command tranny with slipper-clutch; and fully adjustable camber and toe-in. MRC has worked very hard to bring the price into the entry-level range. If you've never run a World Scale car, it's a totally new experience. Maybe it's time to find out for yourself.



ACTION STACKS

Just when you thought things couldn't get any wilder, look what they've done—a gas-powered rig modified from a Tamiya King Hauler. With the conversion kit, you can drop a .12-size engine right into the big truck's engine bay. But wait,



check it out: the engine's exhaust exits the twin scale stacks! No word yet on who makes this thing, but we'll keep you posted. Huber wants one!

(PHOTOS COURTESY OF RCM JAPAN.)

PROVETTI-



ANDRETTI

Memorabilia man Ernie Provetti of Trinity Products has Michael Andretti sign one of his helmets for the "Provetti collection." Ernie says, "Mike is one down-to-earth, good-natured guy." The entire Andretti family (mom included) certainly does display the dignity, sportsmanship and humility found in true champions. We at *Car Action* are all loyal fans and wish Mike, Jeff and, of course, father Mario continued glory and safety in their respective careers.

READERS' RIDES

"Readers' Rides" is our way of recognizing the unique, innovative—and sometimes bizarre!—vehicles that our readers have created. Send us a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids, please!), along with a brief description, to Readers' Rides, R/C Car Action, 251 Danbury Rd., Wilton, CT 06897. If the Ayatollah of Radio Controlla chooses your photo, you'll receive a 6-month subscription to Car Action, or an extension of your existing subscription. You'll also be eligible for the fourth annual "Reader's Ride of the Year Contest" in the fall of 1994. Write your address and phone number on your letter and on the back of each photo you send, in case we need to contact you.



MASTER BLASTER

This killer-looking Tamiya Dyna Blaster comes from Frank Anthony, who's serving in the U.S. Navy in Yokosuka, Japan. The truck is equipped

a Novak M5 ESC and NER 2X receiver and a Dynatech 02H motor. We hear that Frank has been challenging Masami to a race but hasn't heard back from him yet....

CANADIAN ROADIE

Bruce Slater of Ashburn, Ontario, Canada, sent us this photo of his road cruiser, a Bolink Super Sport. The car is decked out with a Novak M5 ESC, a Trinity Joel Johnson Part II stock motor and full ball bearings. Bruce controls the car with a Futaba Magnum Sport radio.



CHOO CHOO KA CHOO

This wild-looking ride comes from John F. Beecher III of Lafayette, IN. The vehicle is a replica of Allen Gaines's Orange Blossom Express tank train. The chassis is a modified Chicago Models Intl. tank with two stock 360 motors, two Hitec speed controllers and two 6-cell packs. The body is completely scratch-built out of .060-inch-thick styrene plastic with real rivets. The boiler is made of 1/4-inch Plexiglas tubes, and it has a functional smokestack made of wood. The headlights work, and the cowcatcher lifts off for car-crushing competition. And check it out: the bell behind the smokestack actually rings while the train moves. All aboard!



HEAVY HITTER

Broderick Hill's trick truck sports an aluminum chassis, a Clodzilla multi-link suspension kit, aluminum body posts and an aluminum steering kit. The truck is also equipped with a twin-tube roll bar with a light-mounting bar and four working lights; a heavy-duty steering-rod kit; twin-tube bumpers and working headlights; a Tekin 610RV ESC; Pro-Line tires; and a Trinity matched 4400mAh battery pack. The truck is controlled by a KO Propo EX-5 radio with help from a PS-701 steering servo. Broderick also custom-built the trailer out of wood, and the project took him approximately four months.



READERS' RIDES



ELEPHANT POWER

We'll let Chris Duerden of Pembroke Pines, FL, tell his own story. Take it away, Chris.... "With the gas-truck craze getting a little out of hand, I decided to jump on the bandwagon. Enclosed is a picture of my RC10T gas conversion. I set out to develop one of the most powerful $\frac{1}{10}$ -scale trucks anywhere. Equipped with a 426ci engine, this truck really goes! Estimated horsepower is 650; zero-to-60 times are around 1 second; and top speed is 275mph. Adapting the Stealth tranny was quite a feat. One day, it actually shot the tranny right out the back of the truck and through a neighbor's front window. I finally got it to work, though. (Boy, the things you can do with duct tape!) Weight transfer and handling also posed a problem, as did the run times, but with a little more research, I think I'll have them all covered at the track. P.S. Know of anywhere I can find a body for this thing?"



KOALA CRUISER

While writing from the Land Down Under to thank *R/C Car Action* for all our efforts, Russ Miller of Macquarie Fields, Australia, also sent this photo of his WCM K-series $\frac{1}{4}$ -scale NASCAR car hoping to get a little international publicity. Sitting alongside Russ's car is a $\frac{1}{4}$ -scale Visible V8 that he has been tinkering with, going for that scale look. Hey, Russ, drop us another line sometime, and let us know what's going on in your corner of the world.



ASPHALT ASSAULTER

Malik Sultan, stationed in Yokata, Japan, sent us this photo of his Bolink California Flyer. Malik's car is decked out with a Futaba S9401 high-speed steering servo and a Novak 410 HPc. A CAM 13-turn Super Stock motor with a Litesink heat sink gets the car rolling. Malik's radio of choice is a Futaba Magnum FM with a R103F receiver.



SITTIN' PRETTY

Andrew Botticelli sent us this photo of his oval-converted RC10 (left) and his father, Don's, 10L (right). Andrew's car finished first in Best Paint, and his father's finished first in NASCAR Concours at a race held at America Hobbies in Englishtown, NJ. Andrew's airbrushed RC10 runs a Bolink '91 T-Bird body, a Raborn graphite chassis, a McAllister lowering kit, Robinson

Racing gears, TecnaCraft titanium rods and a Futaba radio. Don's 10L has a Bolink Pontiac body, a BME Pro-Diff, True Turn racing hubs, Jaco tires and a Futaba radio.

TROUBLESHOOTING

by JOHN HUBER

Illustrations by Steve Collins

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at Radio Control Car Action, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to Troubleshooting, Radio Control Car Action, 251 Danbury Road, Wilton, CT 06897. We regret that, owing to the tremendous number of letters we receive, we can't respond to every one.

Diff Dilemma

I have an RC10 Championship Edition. When I connect the battery to the motor, the motor turns and the slipper clutch turns, but the car doesn't move. I tried tightening the diff gear and the slipper clutch, but it did no good. If I lift the back end off the ground, the tires and everything else spin as they're supposed to. But as soon as I put the back end down, I have the same problem. Please help me.

DALE CLEGG
Higganum, CT

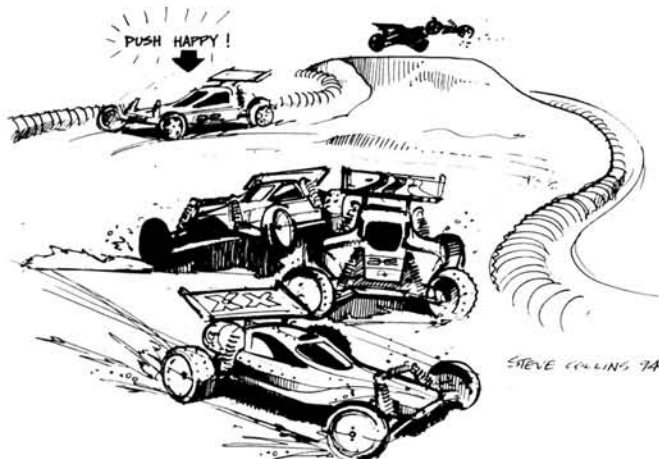
I'LL TIGHTEN
THIS CLUTCH GOOD!



I'll cover both. If you have the old tranny, check to see whether the gear on the top shaft is locked on. It's only pressed on, and it could come loose. If it's loose, heat it up and tap it on the shaft. If you have the Stealth tranny, make sure that you've built it correctly. If

Dale, the Champ Edition RC10 has only recently been upgraded with the Stealth tranny. I'm not sure which tranny you have, so

the diff and the slipper are tight, the rims could be slipping inside the tires. Use superglue to mount the tires on the rims.



Push Comes to Shove

I have an RC10 with an RPM Worlds front end and an incredible problem. The car pushes so much that I can hardly get around the corners of the track without

bringing the car to a crawl. It won't even hug the long sweeper corners. I have all the steering in the world, but no front-end traction. I've tried everything that I

can think of, including putting softer springs on the front shocks and raising the rear end. I even went to a lighter oil in the front shocks, and the car still wouldn't turn. Please help me!

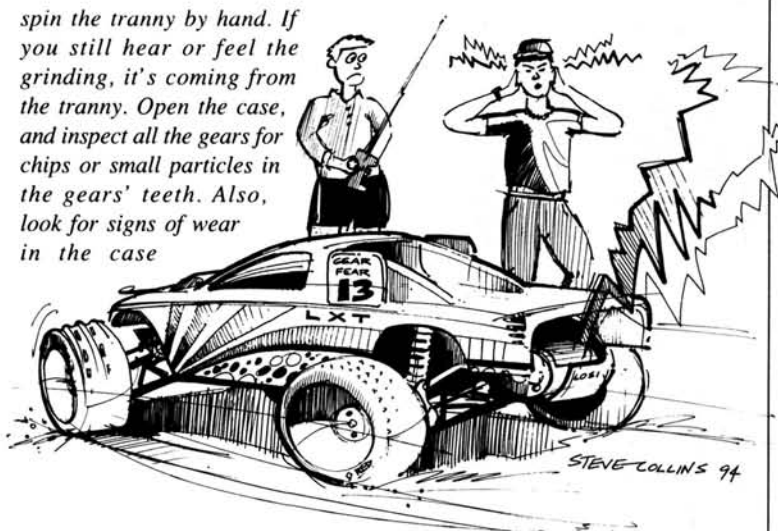
MATT BUESCHER
Folsom, CA

Matt, I called Associated about this one, and they were familiar with the problem. According to Curtis Husting, the narrow front end with longer arms is best suited to slippery tracks. The RPM front end will turn in quickly at the start of a turn, but during the middle and exit, it will push. Your shock adjustments won't help much. If you race on a slick track, you might be able to use the RPM front end, but if it doesn't do the trick, switch back to the old setup; that's what the team does.

Please help! For at least three months, I've had a problem that nobody can figure out. I own a Team Losi LX-T. I bought the MIP internal 2.6 gear conversion, hoping to improve the performance of the transmission. After I had put the new gears in the transmission, it made a high-pitched grinding noise. I did what the instructions said, and I know I trimmed the transmission housings enough. The truck also doesn't accelerate as fast, and it decelerates very quickly. What's wrong?

JAMIE HANSON
Regina, Saskatchewan,
Canada

spin the tranny by hand. If you still hear or feel the grinding, it's coming from the tranny. Open the case, and inspect all the gears for chips or small particles in the gears' teeth. Also, look for signs of wear in the case



To find the source of the grinding sound, use the process of elimination. The pinion or spur could be hitting the gear cover. First, remove the gear cover and try the car. If the grinding noise is still there, the problem might be a chipped tooth on the spur or pinion. Remove the pinion gear, and

Grind or Bind?

where the gears might be hitting. Make sure that the top shaft gear is shimmed properly so that it won't hit the case. And make sure that the cross pin on the top shaft is centered.

MIP's Eustace Moore told me

that the new gears fit a bit more tightly than the old ones, so you'll hear a different sound from the tranny; this is normal. After 10 packs or so, the gears should be broken in and will be quieter.

The Glitch Twitch

I have a Kyosho Triumph, an 828 Novak speed controller, a Futaba 2PBKA Jr. and a Trinity 7-cell 1700mAh SCR Sanyo pack. When I'm racing and I try to stop, my car glitches and keeps going for about 10 feet. Please help! I can't figure it out. My only clue is that maybe the battery is too close to the speed controller. Please, please help!

JOSEPH PALLITTO
Hudson, FL

Well, Joseph, I see what your problem is right off. The 828 ESC was designed for eight to 28 cells, and you're using only seven. Your receiver probably isn't getting enough voltage for proper operation. You must either get a different ESC or add a cell to your pack. The 828 was designed for drag racing and truck pulling, and it isn't the best choice for the Triumph, which is an off-road car.





Sparkomatic

I'm having problems with my Bolink '91 Sport's reception. I have a Futaba Attack III transmitter and an FP-R112JE receiver. My car gets 50 to 60 feet away from me, and I lose control of it. I've

tried placing the excess receiver wire in various places, but I've had no luck. I should have better reception than this, shouldn't I? One more thing: I have a stock 540 motor that's fairly old. I've noticed that many sparks cross from the brushes to the comm. Could this contribute to my problem? I'd appreciate any help you can give me.

DON ZUTOUT
Sterling, MA

Don, I think that you're on the right track. If your motor is old, it will probably make excessive radio noise. Although a good set of capacitors on the motor will zap most of this noise, they can't get it all. I'd try to clean and cut the comm on the motor, or just try a different motor. You should have a range of at least 100 feet with that radio.

Servo Strain

About six months ago, I bought a Pro SE. All the parts ran smoothly. Recently, I've noticed a clicking when I steer in either direction. I investigated the problem and found that there was too much horizontal play in the steering. My friend has a Losi JR-XT, and it works fine. The only difference between our cars—besides Losi mods to the Pro SE—is in the servos.

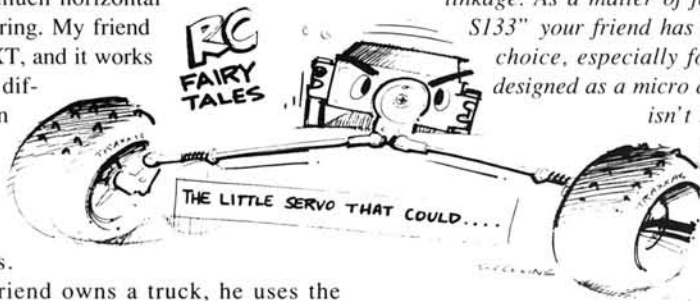
Because my friend owns a truck, he uses the "torquier" Futaba S133, whereas I use the standard S148. Is this problem a Losi production error? Do I have to buy a ball-bearing steering kit, or a new servo? Please help.

JASON E. GARCIA
East Meadow, NY

Your S148 servo is probably the culprit. It was designed to be inexpensive, and it isn't a very good choice for a serious car or truck. It doesn't have bearings, and this could cause slop in the linkage. As a matter of fact, the "torquier S133" your friend has is an even poorer choice, especially for a truck! It was designed as a micro airplane servo and isn't suited to any car!

Are you sure it's the 133? If you want a better servo, try the S9301 or something even better.

Look at servo specs, and compare the speed (transit time) and torque readings to determine which is the one for you. Remember, you don't have to stick with one manufacturer as long as you get the plug polarity right. Your budget will have a lot to do with your decision. ■



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ERNEST AND JULIO Gallo said, "We will sell no wine before its time." Associated* has a similar philosophy when it comes to their R/C cars. They thoroughly test each new car design or component until they feel that it's as good as it can be; then they sell it to the public. In the case of the famed Stealth car, it has been more than four years since its introduction at the '89 Worlds, and it still isn't available to the public.

Knowing that thousands of loyal fans would have bought it because it was the world champ wasn't enough to convince the guys at Associated that it was ready. They still feel that the currently available Team Car is better for most tracks. You know the saying: "If it ain't broke..."

When 1/10-scale gas truck racing caught on a couple of years ago, I thought it would be a long time until Associated came up with their own gas

truck. At the last gas race I went to, Associated drivers were running conversion kits by A-Main Racing. Sure, they did a little custom work, but I thought that they'd be satisfied with the kits' performances for a while. Well, it looks as though the guys at Associated have been puttin' in overtime for sure!

Gas Power Play

T
E
A
M



ASSOCIATED



PHOTOS BY JOHN HUBER

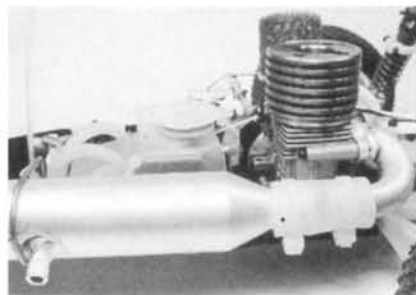
RC 10
GT

by John Huber

MAY 1994 29

SUSPENSION

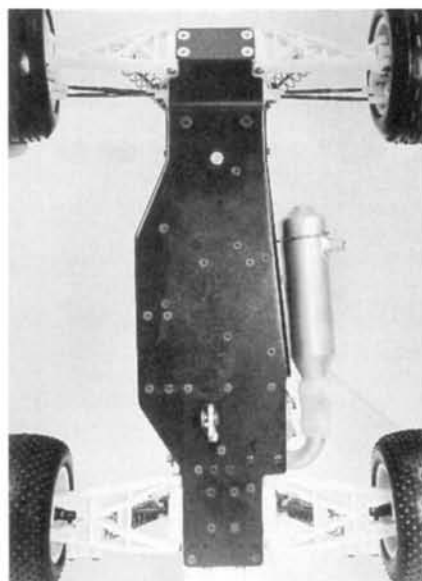
As you might expect, much of the suspension is from the RC10T, but just about everything else is new. Basically, the entire front end is from the 10T, except for the steering bellcranks. They're shorter to provide more Ackerman, and this makes the truck easier to drive. Two sets of holes for the steering rods allow you to adjust Ackerman to suit your needs. The servo-



A tuned pipe is included in the kit. I opted to test the truck with the new Yokomo RX-12, which has an ABC piston and sleeve and a heavy-duty connecting rod.

saver part of the bellcrank can be mounted on either the right or the left side of the chassis to make servo mounting easier.

In the rear, there are a few changes. The arms are from the 10T, but they're mounted backward so that the shocks can be attached from the rear. Nylon adapters are bolted to the arms to provide the proper mounting for the shocks. I was surprised to see that the rear arm mounts have no anti-squat, but they do have 3 degrees of toe-in. According to



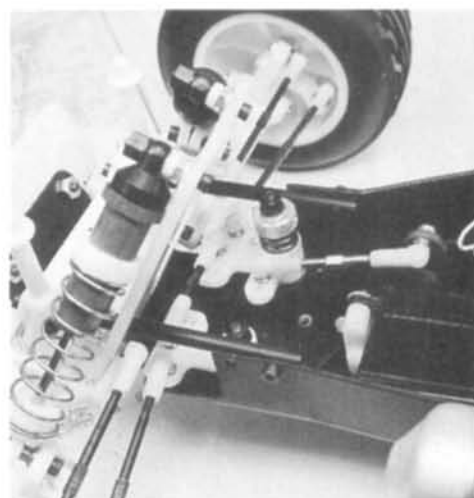
At a quick glance, the chassis might look like its electric counterpart, but it has one flat side to accommodate the exhaust pipe.

Team Associated, because of the way the truck's weight is distributed, there's no need for the anti-squat. Well, they know what they're talking about, so leave it alone.

CHASSIS

When I opened the box and saw the chassis, I did a double take. It appears to be the same as the famous aluminum-tub chassis, but one side is straight. I soon figured out that this was done to accommodate the tuned pipe.

I was pleased to find that the motor mounts help to stiffen the rear end of the chassis. On many of the conversions, the chassis's rear end is left unsupported. When the chassis flexes, the gear mesh can change, and this could destroy the spur gear. On the RC10GT, Associated uses a simple but effective method to ensure that the rear of the chassis is stiff.



The shorter steering bellcranks provide more Ackerman, which makes the truck easier to drive. Two sets of adjusting holes for the steering rods allow you to adjust the Ackerman.

ASSOCIATED RC10GT

Scale 1/10
Price \$445

DIMENSIONS

Overall length 16 in.
Wheelbase 11.1 in.
Front width 12.25 in.
Rear width 12.25 in.

WEIGHT

Gross (without fuel) 4 lb., 0.03 oz.

CHASSIS

Type Tub
Material Aluminum

DRIVE TRAIN

Type Gear
Primary Pinion/spur
Transmission Gear
Differential(s) Ball
Slipper clutch Friction-type
Bearings/bushings Ball bearings

SUSPENSION

F/R: Type 4W independent w/
adjustable upper link
Damping Oil-filled, coil-over shocks

WHEELS

F/R: Type One-piece plastic
Dimensions (DxW) 2.2x2.0 in.

TIRES

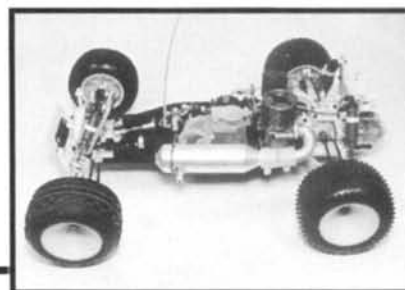
Front Dashed rib design
Rear Pro-Line mini-pin

POWERPLANT

Engine Yokomo RX-12*
Pipe Stock Associated pipe
Carb Stock Yokomo carb*
*Not included with kit

OPTIONS TESTED

Futaba* PCM radio system; Futaba S9301 throttle servo; JR* NES-4735 steering servo; 4-cell, 800mAh receiver pack; SCI* BEC Guardian.



HITS

• Runs just like the RC10T • Great instructions • Videotape makes tuning easy for beginners • Adjustable clutch.

MISSES

• Spur and clutch bell are close to chassis (small pebbles may become lodged).

RC10GT



The receiver pack rests directly on a nylon bumper in the back of the truck. This way, the pack is thoroughly protected by the bumper, and the weight is more evenly distributed.

The rear lower motor mount is bolted between the chassis and the tranny. The front lower mount sits in front of this rear mount and has extensions that run forward on the chassis. When the engine is mounted, it ties the two mounts together. Because the mounts are connected directly to the gearbox, there's no way for the gear mesh to change.

RADIO

Mounting the radio gear was a snap! Associated includes molded mounts that are ready to bolt to the servo and the chassis. Unlike those in the RC10, these mounts are pre-drilled, so all you have to do is screw them on and bolt them down. The receiver also comes with a neat mount. Because fuel destroys servo tape, Associated uses a nylon receiver-antenna mount to hold it down. A small piece of servo tape is used to attach the

receiver to the mount, and two tie-wraps ensure that it stays put. When the receiver has been attached, the mount is screwed to the chassis. I wrapped the receiver in a balloon to protect it from fuel.

The receiver pack is mounted on the rear of the chassis on a nylon bumper. Foam is included to cushion the pack, and two tie-wraps hold it firmly in place. While this rear location is perfect for weight distribution, it does put the pack in a tricky spot. The wire from the pack must be routed from the rear of the chassis through the rear shock tower, between the engine and spur gear and past the gas tank. Just make sure the wire is secure so it won't melt or be cut. I used an extension wire to connect the pack to the receiver, and I unplug it to turn the radio system off.

TRANNY

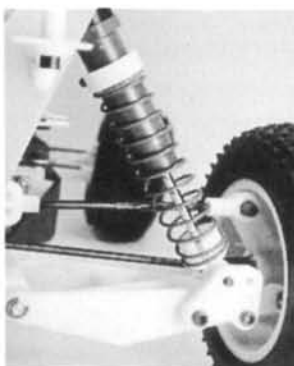
The truck's tranny is based on the famous Stealth. It shares many of the Stealth's parts, but it has been altered to suit the truck. First,

it has a ratio of 2.60:1, which works better for a truck's larger tires. It also has a new case that's lower. The slipper is basically the same, but it's fitted with a 66-tooth, 32-pitch spur gear.

To stop the truck, a disk brake has been added to the tranny. It sits between the slipper and the tranny case, and it's pinched by two plates when the brakes are applied. I should note that the kit I received had a defective brake disk. It seems that the supplier of the disks sent a bad batch of brake material. When I was testing the truck, the disk broke into two pieces. Associated has since fixed the problem, and they assured me that it was limited to only the first few kits. If you have a problem, let them know, and they'll send you a new disk.

ENGINE GOODIES

The engine mount you choose will depend on the engine you use. If you use a pull-start engine, the mount will be higher so that the pull-starter will clear the chassis. A larger fly-



Left: the RC10GT comes with nylon shock-mounting plates so you can bolt the shocks directly onto the reversed rear arms. • Right: the RC10GT is one of the only 1/10-scale gas trucks that uses a disk-brake system. The kit comes with a unique servo mount that precisely controls throttle and brake action.

The video hits the street

If you live in the boonies and you don't have a hobby shop near you or a knowledgeable friend to help you with your first gas vehicle, you'll have to figure it out by yourself. That is, of course, unless you have the RC10GT.

The kit includes a videotape that will guide you through some of the tricky parts and help you to get the truck running right.

In the first part of the video, Associated's Curtis Husting talks about cutting the crank and installing the clutch assembly. The kit's written instructions in this area are very clear, but watching someone else do it helps even more.

In the second segment, Curtis's father, Gene, talks about types of fuel and which ones Associated recommends. Because cars have specific fuel requirements, it's important to use a fuel that's designed for cars and not for planes or helicopters. Take it from Gene; he knows what he's talking about!

Finally, the video goes to the street to show the truck in action. Cliff Lett and Curtis show you everything you need to know to get your engine fired up and tuned properly. They also discuss slipper adjustment and different methods of starting your engine.

Although the video is a little rough and was produced without any fancy graphics or music, it's great! Who cares about graphics and music anyway? I want to see the action—and hear it. And hear it you will. As Cliff makes a carb adjustment, you'll hear the change in rpm; then, when the car takes off, you'll be able to see what the adjustment did for performance.

Associated has made it easy for first-timers to get a feel for glow engines—even for those who live in the most remote area and have never seen one.



The 75cc fuel tank has a built-in filter (made of sintered metal) and a quick-fill lid for easy pit stops.

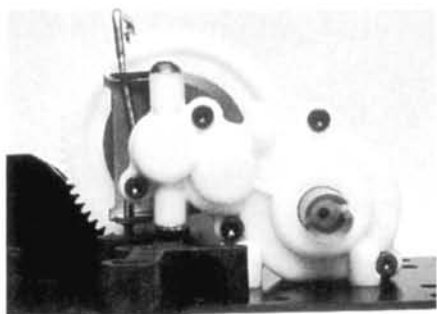
wheel and a raised header are used with the pull-start engines as well. For a non-pull-start engine, use the smaller flywheel and the lower mounts and header. All these engine parts are sold separately so that you can fit the engine of your choice in your truck.

The kit's clutch setup is among the best in the business. It uses a twin-shoe design that allows you to adjust clutch-spring tension to suit your needs. By simply moving the spring to one of four holes in each shoe, you can adjust the engagement from low to high rpm.

Because I used a non-pull-start engine, I used the small flywheel. It bolts to the crankshaft easily, but some cutting is required. Associated includes a gauge to help you determine how much thread to remove, and the video that comes with the kit helps guide you through the cutting process.

The clutch bell is supported by two ball bearings (yeah!); this is more reliable than a simple needle bearing. The included 16-tooth bell is good for most running, but Cliff Lett recommends the 15-tooth for racing.

It's nice that Associated designed their own



The RC10GT's redesigned Stealth tranny features a ratio of 2.60:1—which suits trucks better—and an all-new, lower-profile case design. It's fitted with a 66-tooth, 32-pitch spur gear.

air filter. It uses a paper element and a foam pre-filter to trap dirt. It's secured to the carb with an included rubber adapter and a couple of tie-wraps. Fitting the adapter to the Yokomo* carb was a bit tricky because of the idle screw, but I managed to get it on.

TANK

Another nice feature on the GT is the 75cc fuel tank with a built-in filter and a quick-fill lid. It's secured to the chassis with three screws, and to reduce vibration, it's isolated by O-rings. Associated uses a "chicken-hopper" pressurization system for the tank. I have no idea what it has to do with a chicken, but I do know that it was designed to keep

the pressure consistent regardless of the amount of fuel in the tank.



The clutch design is one of the best setups on the market. The twin-shoe design allows you to adjust clutch-spring tension by moving the springs to one of the four holes on each clutch shoe.

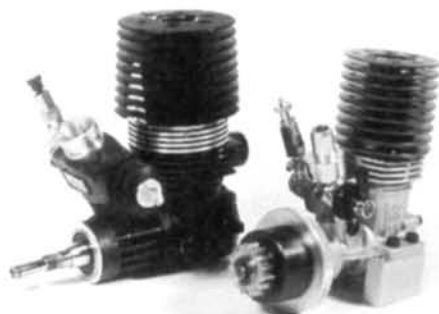
ENGINE

The RC10GT was designed to accept any of the popular .12-size engines. I chose the new Yokomo RX-12 because the craftsmanship looks so good. Although the O.S., Prafa and Yokomo engines are all similar in their external dimensions, the Yokomo has some interesting features.

First, it has a true ABC (aluminum, brass, chrome) piston and sleeve. The O.S. has an ABN (aluminum, brass, nickel) design that works well, but the ABC design has more power. To complement the ABC design, Yokomo also created a heavy-duty connecting rod that's bushed at the top and bottom. And, as if that weren't enough, they designed a trick crankshaft. The new design has "turbo notches" that are designed to improve fuel distribution in the crankcase. For increased reliability, the crank is also supported by larger bearings. Add to this a hot carb and a heat-sink head, and the new Yokomo is ready to tear up any track.

One thing I didn't like was the location of
(Continued on page 136)

ROAR ENGINE RULES



.12 Engine Specs

Max. displacement	129 cubic-inch displacement
Max. carb bore	5.5mm
Max. exhaust-port height*	4.5mm
Max. crankshaft gas passage i.d.	7mm
Max. number of internal ports	4 (incl. exhaust port)
Max. muffler outlet pipe bore	5mm
Min. muffler outlet pipe length	15mm (outlet must be horizontal or pointing downward)
Max. dB level	77
Max. fuel-tank capacity	75cc (incl. filter and line from carb)

- Only front rotary-shaft valve, 2-stroke engines are allowed; no forced induction or any form of variable port timing is allowed. Air-cooled engines only. Only glow-plug engines with standard 1/4-inch UNC-type plugs with UNEF threads are allowed.
- These additives are strictly prohibited: hydrazine, hydrogen peroxide and toluene.

.15 Engine Specs

Max. displacement	152 cubic-inch displacement
Max. carb bore	6mm with spray bar, 4.5mm with open bore
Min. stroke	14mm
Max. exhaust-port height*	4.5mm
Max. crankshaft gas passage i.d.	7mm
Max. number of internal ports	4 (incl. exhaust port)
Max. muffler outlet pipe bore	5mm
Min. muffler outlet pipe length	15mm (outlet must be horizontal or pointing downward)
Max. dB level	77
Max. fuel-tank capacity	75cc (incl. filter and line from carb)

- Only front rotary-shaft valve, 2-stroke engines are allowed; no forced induction or any form of variable port timing is allowed. Air-cooled engines only. Only glow-plug engines with standard 1/4-inch UNC-type plugs with UNEF threads are allowed.
- Engines will be run in standard form with no internal modifications permitted.
- These additives are strictly prohibited: hydrazine, hydrogen peroxide and toluene.

*The exhaust-port height is considered to be the distance from the piston's crown to the uppermost point of the exhaust port (measured with the piston at bottom dead-center of its stroke).



TAMIYA **Alfa Romeo** by John Huber



155 V6 TI



ARRIVEDERCI!

ONE OF the most popular classes of racing in Japan is 4WD on-road. In this class, Tamiya* has quite a few cars to choose from, the newest of which is the Alfa Romeo 155 V6TI. And when

Tamiya makes an Alfa (or any car), they make it right down to the wipers and door locks. **The realism of this car is astounding!**

I had to fight Chia-Head for the Alfa, but it was worth it, because it handles well and looks great!

FEATURES

The Alfa has a plastic tub chassis and a 4W, independent suspension damped by oil-filled shocks. A shaft delivers power from the rear gearbox to the front wheels for full-time 4WD. The body is a work of art, and it includes a fully detailed interior with a driver.

CONSTRUCTION

Building a Tamiya car is always a pleasure. The parts are labeled well, and the instructions are topnotch. The only thing missing is a history of the real car. I wish they still included a history with the model; it's a nice touch!

Though the kit is easy to assemble, there's a fair number of parts, and this could scare a novice. If you take your time and don't try to finish it in one night, you'll have no problems. Building the rear diff is the trickiest part; it has lots of tiny parts, so make sure that you do it right. A nice feature is the quick-access diff hatch. Just remove four screws, and the rear diff slides right out of the tranny case.

The center drive shaft works well, and I found a way to reduce vibration while it's running. The shaft fits loosely into plastic cups on the front and rear transmissions. When the shaft rotates, it wobbles

more than I like, so I removed the plastic cups at each end and replaced them with a short piece of fuel tubing. The tubing keeps the shaft centered and all but eliminates the wobble. The tubing also holds the lube better.

Painting the Alfa was a breeze. Tamiya includes masking that's marked for each window. Just cut along the lines, and stick 'em on! First, I painted the bottom edge of the doors black. Then I shot the rest of the body with red, and that was it.

Detailing the Alfa took some time. There are two huge sheets of decals to trim and apply. It looks cool when it's finished, but, boy, does it take a while. For the hood and door decals, I removed a large portion of the clear material after I applied the decals, because it looks better. After I

A molded tub chassis joins front and rear gearboxes to form a very rigid assembly. Short suspension arms give the Alfa a narrow, scale stance.

had mounted the wipers, the mirrors and the wing, it was time to mount the body to the chassis.

TESTING

The first time I tested the Alfa, I headed outside to the quiet street next to my house. A little adjustment of the trim, and the car was off and running. I was surprised by how quiet the car was (maybe because of all the gas I've been running lately), but it sure seemed quiet. With the standard motor included in the kit, the car was quick, but easy to control; in fact, it was almost too easy. Each time I tried to get it to spin and slide, it just

TAMIYA ALFA ROMEO 155 V6TI



Scale.....1/10
Price.....\$268

DIMENSIONS

Overall length.....18 in.
Wheelbase.....10.1 in.
Front width.....7 in.
Rear width.....7 in.

WEIGHT

Gross (ready to run).....3 lbs., 2 oz.

CHASSIS

Type.....Tub
Material.....Plastic

DRIVE TRAIN

Type.....Gear
Primary.....Pinion/Spur
Transmission.....Gear
Differential(s).....Ball/bevel gear
Slipper clutch.....None
Bearings/bushings.....Metal and plastic bushings

SUSPENSION

F/R: Type.....4W independent
w/ fixed upper link
Damping.....Oil-filled coil-overs

WHEELS

Front: Type.....One-piece plastic
Dimensions (DxW).....2.0x1.0 in.
Rear: Type.....One-piece plastic
Dimensions (DxW).....2.0x1.0 in.

TIRES

F/R.....Semi-pneumatic slicks

ELECTRICS

Motor.....Stock Mabuchi 540
Battery.....7.2V, 1400mAh Trinity* pack
Speed controller.....Mechanical 3-step

OPTIONS AS TESTED

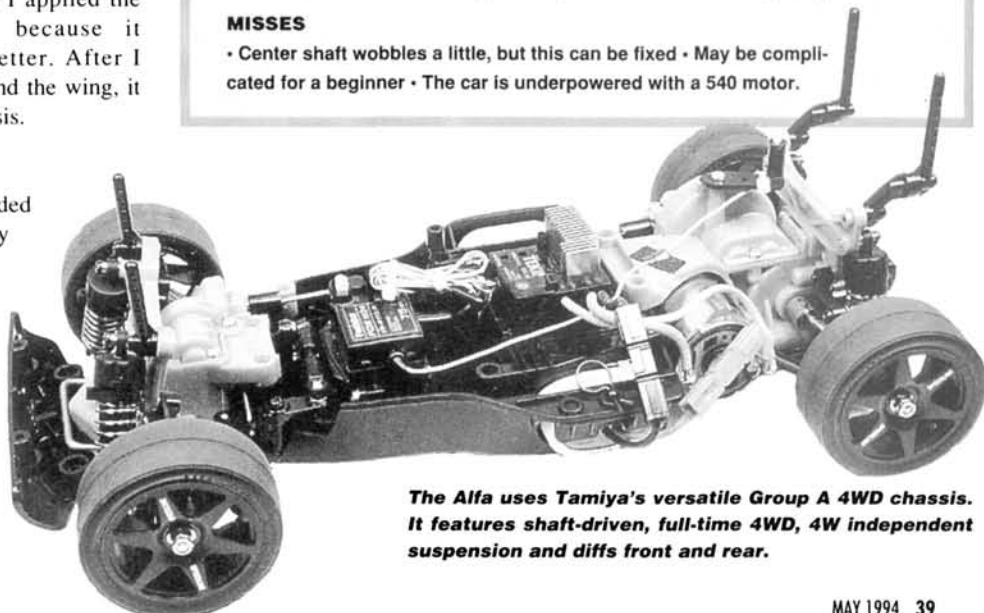
Futaba* PCM; Futaba 9301 steering servo; Team Losi* 11-turn motor; Tekin* 411P ESC

HITS

• Incredible detail on the body • Great performance • Brilliantly designed.

MISSES

• Center shaft wobbles a little, but this can be fixed • May be complicated for a beginner • The car is underpowered with a 540 motor.



The Alfa uses Tamiya's versatile Group A 4WD chassis. It features shaft-driven, full-time 4WD, 4W independent suspension and diffs front and rear.



Technology marches on! 'EX'-TECH IS HERE

Ever heard someone say "This motor is 2 years old and it still runs great"? Well, maybe so, but what's more likely is that the person has gotten used to the motor as it has deteriorated over the years. Give that someone a fresh motor or rebuild that one and they will see the difference. There are cases where the old motor may be preferred. This is often the case if the new motor was not right for the application or was not correctly geared. When I say not the right motor, what I mean is this: the old motor may have been a 15-turn double. The person buys a new 15-turn double and wow!—it doesn't run the same! Why?

CHANGING TECHNOLOGY

There is no more rapidly changing aspect of R/C racing than motor development (although cars are close behind). As motor components improve (magnets in particular), characteristics change. If you want the power curve of a motor from 2 to 3 years ago, it might require a motor with 1 or 2 turns less using today's technology and if you get a motor with the same turns, it will probably require a different gear because it will generate less rpm. Note that I am referring to modified motors; stock motors are another story altogether.

The reason that these effects take place is far too involved to get into in this column, but they happen. This is why Trinity's new EX-TECH motor line is offering a 7-turn motor—the EX-0107. It's not that we are trying to sell the lowest turn/highest rpm motor on the market, but rather that we are striving to retain the same overall power range in our motors—from our previous 'Championship' series to our new 'EX'-TECH line of high-performance motors.

WHEN TECHNOLOGY MARCHES ON, USE IT! THE TRINITY 'EX'-TECH MOTOR LINE

A THOUGHT...It may be time for a new standard to compare motors with—something besides turns! Think about it!!

Until next month,
Neal McCurdy
Trinity Team Manager

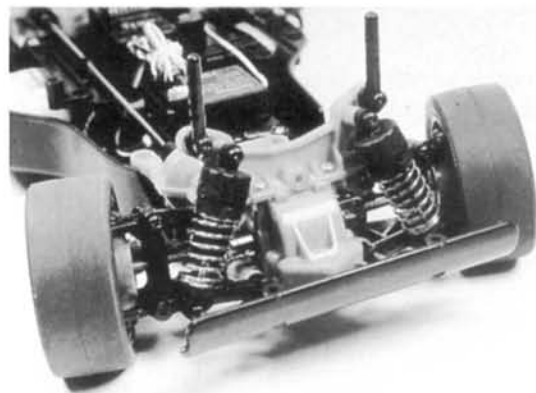
ADVERTISEMENT

ALFA ROMEO 155

stayed planted to the ground. The only time I got it to spin was in some sand. Yeah! The suspension soaked up the mild bumps with ease and even handled the bigger ones. Basically, the car could handle whatever I dished out, so it was time to push it over the edge.

I went back inside and dug out an old motor—an 11-turn single; yeah, that should make the car a bit more hairy! With a fresh pack, I headed out the door again. This time the tires broke free as I punched the throttle, and the car sped off down the street. With the new motor, the car was absolutely overpowered (and much more fun). Now I could try to do some controlled spins and tricks. The suspension still handled the bumps without a problem, but the body leaned a little during high-speed turns.

After a couple of runs, I started to notice wear on the tires. This probably had to do with the sliding turns and donuts that I was doing! I was itching to do some parking lot thrashing, but we were hit by snow the next day. When the snow froze over, I knew it would be a while before I'd



A formidable-looking bumper protects the front gearbox from damage. Plastic, oil-filled shocks at all four corners keep the tires in contact with the road.

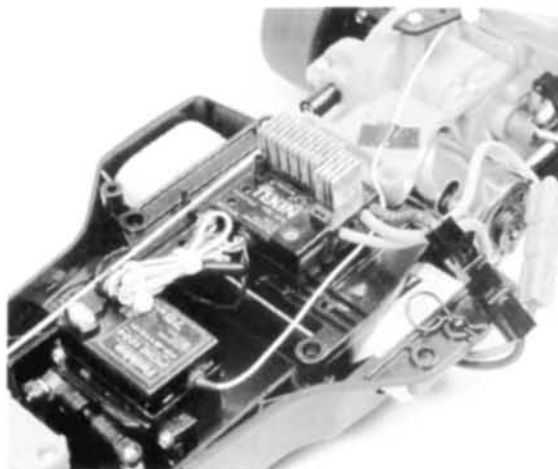


The Alfa's one-piece wheels sport semi-pneumatic rubber tires that are specially suited to paved surfaces.

see blacktop again, so I went out anyway. My backyard was smooth and flat with a nice little berm on one side. I put the car down and punched it. Man, did it scream! It lit the tires up instantly and slowly crept forward across the ice. After a few feet, it started to kick in, but stopping was just as tough. I had to get the car to spin and punch it again to turn. The berm made for some cool banked turns, if I could keep from flying over the top! In a few minutes I was doing a nice oval in my backyard—sideways. Hey—ice racing!

There's an idea for winter fun.

I can't wait for Doogie and his faithful sidekick Frank to build their 4WD cars so we can have some serious parking lot fun. With a little room and some corner dots, we could have a real blast! Maybe if they try mine, they'll be hooked, too.



The tub chassis provides ample protection for the car's electronics. A small-diameter shaft transfers power from the rear gearbox to the front.

**Here are the addresses of the companies mentioned in this article:*

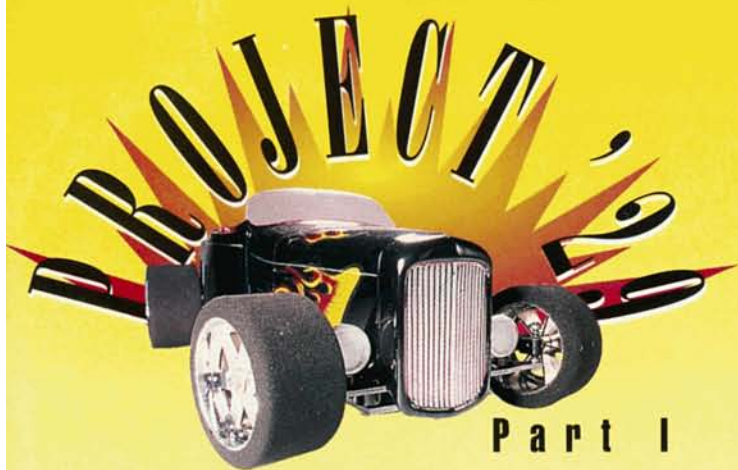
Tamiya America Inc., 2 Orion, Aliso Viejo, CA 92656; (714) 362-2240.

Trinity Products Inc., 1901 E. Linden Ave., # 8, Linden, NJ 07036; (908) 862-1705.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

Team Losi, 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400.

Tekin Electronics, 940 Calle Negocio, # 140, San Clemente, CA 92673; (714) 366-9016.



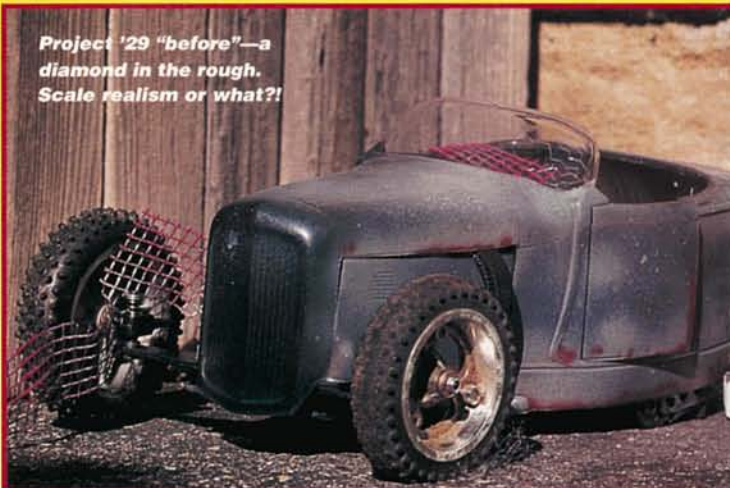
by Mike Ogle

BUILDING YOUR OWN hot rod—a dream that's as American as baseball and mom's apple pie. In the '50s, young speed enthusiasts could buy an early model coupe or roadster, strip it down and then hop it up for maximum speed—and maximum fun—at a minimum cost. But for the wanna-be hot rodder in the '90s, finding a piece of "vintage tin" that's suitable for restoration can seem like the search for the Holy Grail.

Thanks to Parma*, we can all now share the dream of owning and building our own vintage hot rod—in 1/10 scale—with their new '29 Ford Roadster kit. It embodies what made hot rodding great—simplicity, classic good looks and, best of all, a price that's reminiscent of the good ol' days! This month, we'll start our "Project '29" series by concentrating on detailing its interior.

Project '29 "before"—a diamond in the rough. Scale realism or what?!

PHOTOS BY MIKE OGLE

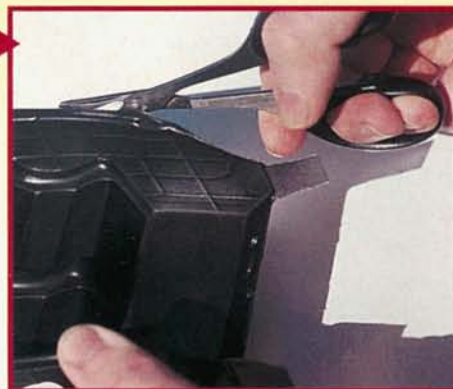


Get Out Your Scissors

1 This is one of the few R/C car kits that comes with a full vacuum-formed interior: seats, dash, steering wheel—even pedals (not just a head with a severed torso like those we're used to seeing). This multi-part interior is a big reason why the '29 Roadster is such a pleasant surprise in the realism department.

Start by trimming the interior piece with a pair of curved Lexan scissors such as those offered by Parma, Kyosho* and Tamiya*. Follow the drawings in the instructions; the shaded parts show which areas are to be trimmed away.

One amusing note: Parma's warning on page 5 of the instructions: "Remember, a hole can always be made bigger if needed, but it's tough to make it smaller, so take your time." Amen. Or, as I've said before, trim the Lexan off a little at a time—not in big whacks. Proceed carefully and enjoy the building; how much TLC you put into building and detailing your Roadster will determine the quality of your results. Don't worry; this kit is easy to assem-



ble (it has a very low parts count), and you'll be running your Roadster in no time!

After trimming out the main interior "bucket," drill the 1/8-inch hole for the steering column, and spray the interior black. I sprayed the outside of mine a dull, flat "leather" look. If you want a glossy, patent-leather look, spray its underside.

Detailing the Interior



Upholstering the Seats

stery. Look for fabrics that have very small patterns, and get a yard of several patterns and colors. Why buy a whole yard? Well, they might sell you half a yard (18 inches) of what you need, but I quickly learned that when I tried to buy two

2 The molded-in seats look fine with just a coat of paint, but I couldn't help noticing that they're sunken between the armrests, and they aren't too rounded, so they're perfect candidates for detailing with cloth or leather.

At a fabric store, I found an overwhelming variety of materials that could be used for uphol-

stering. I'd be given the kind of look that Medusa was famous for.

Cut two 5x1 1/2-inch strips. To glue the fabric to the seats, use a contact adhesive, such as Pliobond or Shoe Goo. These thick, rubbery adhesives won't readily soak into the fabric, and they work very well with it. Start by gluing the bottom edge of the fabric to the seat, then work your way up to the top of the seat, where any excess material can just be tucked under the trimmed-out edge of the body (no need to trim it off closely).



Mission Impossible

3 Next, with your curved Lexan scissors, trim out the dashboard and, as indicated, drill the appropriate $1\frac{3}{4}$ -inch hole for the steering column to pass through. Set the dash aside for now, because we'll paint it the same color as the body later.

Now look at the instructions and check the trim indicated for the steering wheel. No way! This was one tricky trimming job that I sure didn't want to tackle, so I didn't—I cheated! At the plumbing-

supply section of the hardware store, I bought a black, $1\frac{3}{16}$ -inch-diameter, neoprene-rubber O-ring for about 25 cents. Then I trimmed out just the center spokes of the steering wheel (cutting away the rim) and glued the O-ring to the spokes. The black O-ring looks great as it is and doesn't require painting. I painted the wheel spokes flat aluminum with a black trim insert section. This was much easier, and it's better looking, too!



Adding a Shifter

4 While in the fabric store, I found a box of straight pins with large, round heads in a variety of colors; they make good-looking stick shifts. This is a good, inexpensive detailing trick that will run you about a buck for a box of 40 to 50 pins. I put a little bend toward the head of a pearl-white pin, and I drew an "H" on the head with a

fine-point Sharpie marker.

The shift boot at the base of the stick is a rubber servo-mounting grommet into which I drove the sharp end of the pin. If you plan to change your Roadster into a stick-shift car, don't forget to add a clutch pedal! Glue a small rectangle of black plastic to the floorboard to the left of the steering column, and use a fine-tipped brush and some silver paint to detail the pedals to match.



Back to the Dash

5 After you've decided on your Roadster's color, mask off the rounded section of the dash where the gauges are, and paint the dash to match. Leave the little center section clear, as shown in the photos.

Then cut out the instrument cluster graphic we've provided, and tape it to the underside of the dash, letting the faces of the gauges show through the clear lens. I'm sure you'll agree that this is a lot easier to do than trying to detail the gauges by hand!



Buckle up

6 When the glue has dried on your newly upholstered seats, add seat belts. I used $\frac{1}{8}$ -inch-wide ribbon that has a great woven texture and stitched edges; it looks exactly like a little nylon seat belt. Just add a tiny square of chrome MonoKote* as a belt buckle. I made standard lap belts, but if you equip your Roadster with a 12-turn motor or something hotter, you might want to put in five-point, competition-style belts for even more "safety"!

The Final Touches

7 Finish detailing your car's interior with a permanent-ink, fine-point black marker, such as a Sharpie or Parma's Body Detailing pen. Add any final trim you want with a Pilot Silver marker, which makes perfectly round dots that simulate rivets and buttons (like those in a button-tufted interior). Details made with a Pilot marker aren't very durable; their metallic paint will wear off if the car is handled a lot, but they should last well in the interior.

That just about wraps up the first phase of Project '29! Now that the interior is in good shape, we'll start to work out the body, the driveline and electrics, and the engine details. Of course, any technique presented here



will work equally well on any other kind of car you might be building, so don't hesitate to experiment.

Not everyone gets a chance to own a classic hot rod, so stay with us as we go through the project step by step and show you the detailing tricks that will make your street beast a standout at the local drive-in!

*Here are the addresses of the companies that are mentioned in this article:
Parma Int'l, Inc., 13927 Progress Pkwy., North Royalton, OH 44133.
Kyosho/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.
Tamiya America Inc., 2 Orion, Aliso Viejo, CA 92656; (714) 362-2240.
MonoKote/Great Planes Model Distributors (address above).

Is Losi's Latest also its Greatest?

by
FRANK
MASI

IN THIS CORNER— THE CHAMPION!

WHEN TEAM LOSI'S* JRX-Pro SE first came out, we thought it was the most technologically advanced off-road car in production. It made use of some very high-tech materials and manufacturing processes. From its molded fiber matrix/resin chassis to its strong, self-lubricating transmission gears, the Pro SE was, and to many still is, a top dog on any track.

Over its nearly three-year production run, the Pro SE underwent continual refinement. Small items, such as improved shock pistons, were added to the kit as a running change. Other more substantial additions were made

available as after-market upgrades—the most notable being the Jammin' Products* Steering Enhancement kit and the Double-X Retrofit Transmission. These improvements, small and large, allowed the Pro SE to remain at the leading edge of R/C off-road technology.



PHOTOS BY WALTER SIDAS

Double-X versus JRX-Pro SE

INTRODUCING THE CHALLENGER!

Ironically, the first prototype of the Pro SE was informally called the "XX" by Team Losi racers at the '91 IFMAR Off-Road World Championships. The car did very well, with Kyle Reed placing a respectable third overall in the 2WD class. While production cars were being made from this early prototype (which

would go on to sweep the '91 ROAR Nats), Losi engineers were already hard at work on its sequel—one that bears little resemblance to any prior Losi vehicle, production or prototype. That design is the car that you know today as the Double-X!

The production Double-X shares only its shocks with the Pro SE; the rest of the car, from its multi-piece, molded chassis

to its innovative, molded, rear shock tower, was designed and built from the proverbial blank sheet of paper.

The question we need to ask is simple: is the Double-X really better than the Pro SE? And, if it is, is the difference substantial enough for Pro SE owners to invest in a new car so that they can remain competitive? The following is a comparison of the Double-X and an updated Pro SE that has the steering-enhancement kit and the Double-X tranny upgrade.

Chassis

A chassis is the foundation of any car, and its strength plays an instrumental part in a car's overall performance. The Pro SE's one-piece chassis is nothing short of a molding marvel. It's shaped and channeled to provide impressive torsional and fore-and-aft rigidity, yet it's lightweight and fairly inexpensive to replace. An upper chassis plate, which spans from the front bulkhead to the battery compartment, further stiffens the Pro SE.

The Double-X has a molded chassis also, but it's a modular design. The center chassis section features raised sides, which add strength, lessen the likelihood that the chassis will rub on the ground during cornering and form a channel in which the battery sits. The front suspension is attached to the center chassis section with a hinge, so it may be swung out of the way for easy access to the steering components. The rear portion of the chassis is bolted to

JRX-Pro SE



Double-X

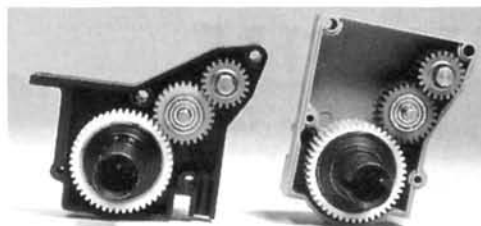
the center section, and it holds the rear suspension. This rear piece also includes the rear arm mounts, and because it's molded as a unit, the geometry of the rear arms is always exact and symmetrical. Additionally, the underside of the main chassis is completely smooth with no screw heads to snag the ground and slow the car.

Strength-wise, the chassis of the Pro SE and the Double-X are quite similar; however, the modular design of the Double-X's chassis, plus its added versatility, make it clearly superior.

Transmission

The Pro SE that was tested for this story was fitted with a Double-X tranny. Though this can be considered an after-market modification, most racers have made this change to their cars, and our goal was to compare the Double-X car with the Pro SE as it is raced.

Internally, the transmissions of the Double-X and the Double-X Retrofit are identical. On the Double-X, however, the transmission case has been configured to lower its center of gravity. The tranny "leans" rearward, and the motor-mounting plate positions the motor low and farther forward. Center of gravity notwithstanding, both trannies fare equally well.



Double-X

JRX-Pro SE

At a Glance

Double-X—arguably the most technologically advanced car you can buy, yet it doesn't overwhelm with complexity. Very user-friendly. Great on rough, rutty tracks.

JRX-Pro SE—an old favorite that still holds its own on the track. Durable construction and a host of available after-market parts ensure longevity.

DOUBLE-X

Price\$339.95

DIMENSIONS

Overall length15 in.
Wheelbase10.625 in.
Front width9.625 in.
Rear width9.875 in.

WEIGHT

Gross (with batteries)3 lb., 8.5 oz.

CHASSIS

TypeThree-piece modular
MaterialMolded composite "Stiffzell"

DRIVE TRAIN

TypeSealed-gear drive (2.19:1 reduction)
PrimaryPinion/spur (88-tooth spur incl.)
TransmissionUniversal-joint/dogbones
Differential(s)Adjustable ball diff
Slipper clutchFriction-type w/Hydra Drive
Bearings/bushingsSealed ball bearings

SUSPENSION

F/R: TypeIndep. A-arm w/ adjustable upper camber link
DampingOil-filled, coil-over shocks

WHEELS

Front: Type "XX" offset w/dirt shield
Dimensions (DxW)2.1x.75 in.
Rear: Type22 Caliber w/dirt shield
Dimensions (DxW)2.2x1.625 in.

TIRES

FrontA-7201 HT ribbed
RearA-7364 HT P "IFMAR" stud

JRX-PRO SE

Price\$299.95

DIMENSIONS

Overall length15 in.
Wheelbase10.875 in.
Front width9.68 in.
Rear width9.79 in.

WEIGHT

Gross (with batteries)3 lb., 9.34 oz.

CHASSIS

TypeOne-piece molded
MaterialComposite: matrix fiber/resin

DRIVE TRAIN*

TypeSealed-gear drive (2.18:1 reduction)
PrimaryPinion/spur (86-tooth spur incl.)
TransmissionMolded slider shafts
Differential(s)Adjustable ball diff
Slipper clutchFriction-type
Bearings/bushingsSealed ball bearings

SUSPENSION

F/R: TypeIndep. A-arm w/ adjustable upper camber link
DampingOil-filled, coil-over shocks

WHEELS

Front: TypeOne-piece "logo"
Dimensions (DxW)2.1x.75 in.
Rear: TypeOne-piece "logo"
Dimensions (DxW)2.0x1.375 in.

TIRES

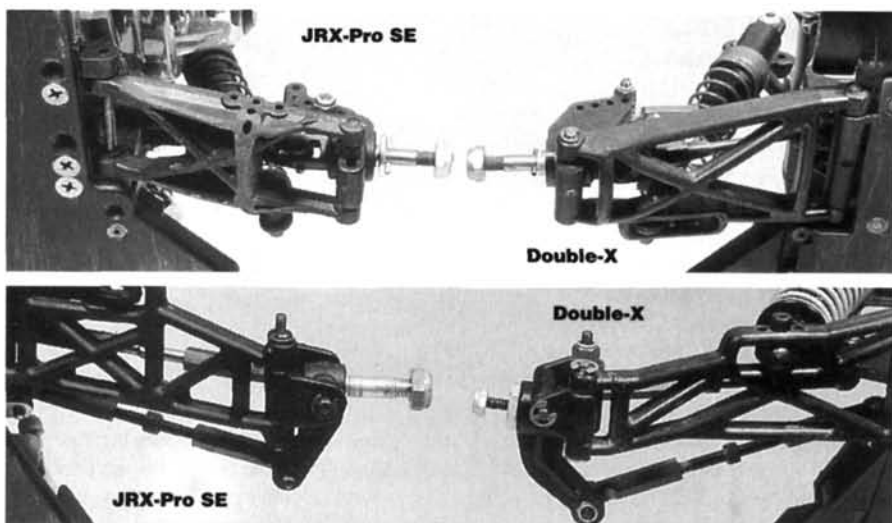
FrontA-7211 Stagger rib
RearA-7321 "X" pattern

*Note: Double-X Retrofit transmission used in comparison test

Suspension and Steering

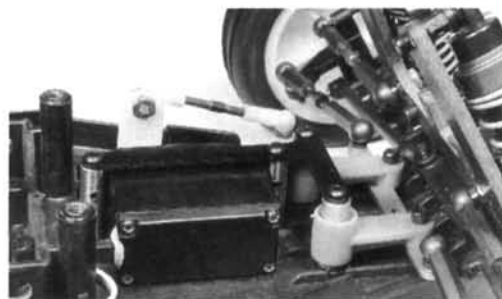
The Pro SE uses a "long arm" that provides stability, especially on rougher tracks. With long arms, wheel track tends to stay more constant as the suspension operates, so there's less lateral tire scrub. However, there's a slight tradeoff that happens when long suspension arms are used: weight transfer can occur more slowly, and this results in sluggish transitional handling, i.e., slower steering response. The Pro SE has this problem; the Double-X, which has even longer arms, does not. How did Losi pull this off? "It's a combination of things," says Losi's Jack Johnson, who played a large role in the Double-X's development. "The car's roll center, amount of camber rise [the amount of negative camber that occurs as the suspension compresses] and the minimal amount of wheel scrub all add up to make the car react more quickly than the Pro SE."

For added steering consistency, the kingpins of the Double-X

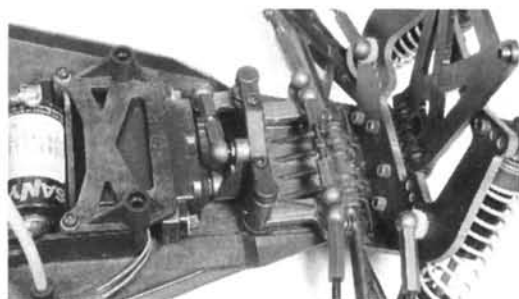


are centered in the wheels, while those of the Pro SE are offset. The major advantage of centering the kingpins is that cornering remains fairly neutral, without the "push, hook, push" condition that plagues many cars.

Compare the steering setups of both cars, and the Pro SE, though it has an excellent, dual-bellcrank setup, can't match the Double-X's sophisticated system. A built-in servo-saver, adjustable Ackerman (the Pro SE uses a one-piece sector arm) and included servo arms for proper geometry tip the scales heavily in favor of the Double-X.



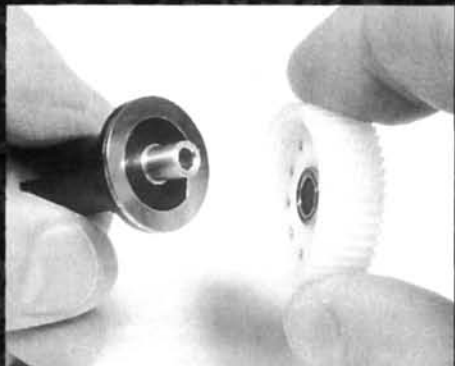
JRX-Pro SE



Double-X

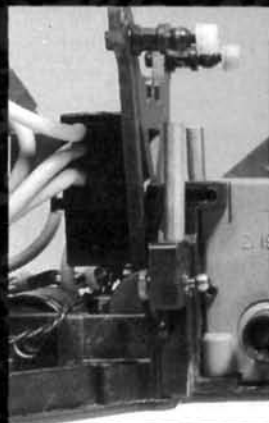


◀ **The single most important modification you can make to Losi's JRX-Pro SE is to install the Double-X Retrofit transmission kit. The Retrofit tranny has fewer moving parts than the SE's stock tranny (compare the Double-X's three gears with the SE's six), and its bottom-mounted ball diff allows the car to carry much more speed through corners.**



◀ **One of the more interesting features of the new Double-X ball diff is what I call its "thrust-bearing tube." This tube is mounted in one of the outrdrives, passes through the diff gear and enters the**

other outrdrive. The thrust-bearing screw passes through this tube and clamps the outrdrives around the diff gear. The tube ensures perfect alignment between the diff parts, and that makes diff action smooth.



Install the Double-X Retrofit Transmission Kit

Building and Maintenance

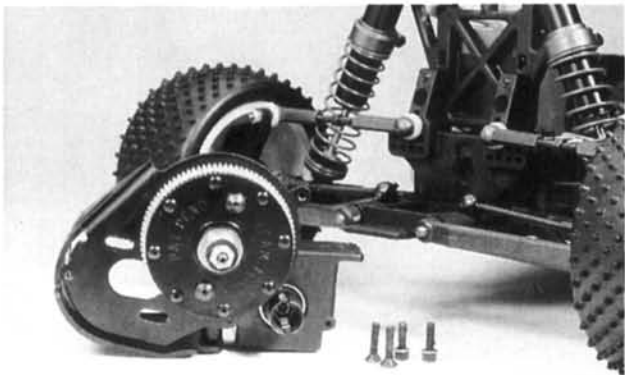
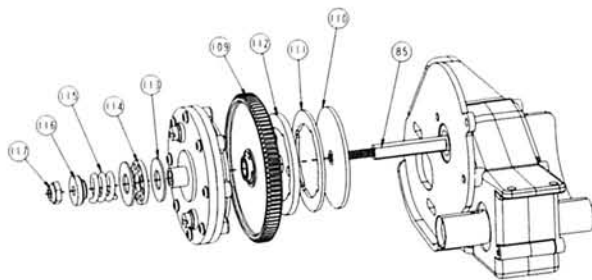
In general, we've always given Losi kits the highest marks for their instructions and ease of assembly. Certainly, the Pro SE and the Double-X are no exceptions. The Pro SE goes together smoothly, and the instruction manual features clear illustrations and text, along with a helpful supplement on track tuning.

Building the Double-X doesn't take an inordinate amount of skill; in fact, I recommend this car to all but the most inexperienced. For every major assembly, the manual contains illustrations taken directly from Losi's computer-design program and, simply put, they blow away the SE's drawings.

Part of owning and racing a car is maintaining it between races. In this area, the Double-X shines far more brightly than the Pro SE. To take out the transmission, just remove four screws; you won't have to disturb the rear suspension. On the Pro SE, removing the tranny means disassembling the entire rear end of the car.

Also, you can easily swing the entire front suspension assembly of the Double-X out of the way in a matter of seconds and gain quick access to inner camber-rod locations and to the steering system.

We've worked on both cars, and the Double-X is much easier to take apart and to clean than the Pro SE. As much thought seems to have gone into making the Double-X user-friendly as has gone into making it a top performer.



Installing the Double-X Retrofit tranny is fairly easy; however, to provide adequate clearance for the gear case, make an indentation at the rear of the chassis with any type of rotary grinding tool. (Note: new chassis come with the indentation.)

When installed properly, the Double-X tranny will significantly boost the performance of the Pro SE. Losi's friction slipper comes with the Retrofit, and the Hydra Drive can be bolted right on. Universal-type drive shafts (available from Losi) must be used with the Double-X tranny, although many of the early retrofit kits included the shafts as a bonus.



Conventional "bones" shaft (top). MIP CVD shaft (below).

MIP MODS

When a new car comes out, Eustace Moore wastes no time coming up with ways to make it better. Here are two examples of MIP upgrades for Losi products:

First up is the CVD (Constant-Velocity Drives) kit for the Double-X tranny. CVDs are MIP's fully rebuildable drive shafts that function much like the CVs of a full-size, front-wheel-drive car. Unlike conventional drive shafts, there's little interruption in the power transmission from the car's motor to its wheels. CVDs make for a smoother, stronger drive train.

The CVD kit for the Double-X tranny (part no. CVD-XXB) fits the Double-X car and the Pro SE with the Double-X Retrofit tranny. If your CVDs become damaged or worn, all the parts can be bought separately:

Bone for Double-X CVD—no. CVD-9

Axle for Double-X CVD—no. CVD-11

Hardware kit for all CVDs—no. CVD-6

Coupling for all CVDs—no. CVD-4

MIP also makes a rebuild kit for the Losi Double-X differential (no. LXX-150). It includes high-quality, polished diff rings, super-hard carbide diff balls and a small container of MIP's diff lube. If it's time to rebuild, consider this kit.

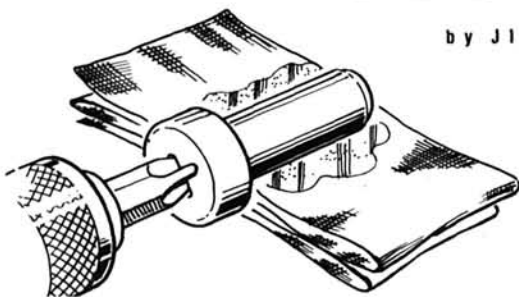
Who's Top Dog?

As of this writing, we haven't seen much from the Double-X on the national racing scene. It did top qualify at the Worlds, however, and it's making quite a splash with local racers, most of whom have traded in their Pro SEs for the new car. If your driving is topnotch, and you know something about car setup, get the Double-X. You'll be faster on most tracks. If you own a Pro SE and are at the intermediate or even beginner level, stick with the car you have. And if you don't have the Double-X tranny upgrade yet, consider getting one; it makes a big difference.

*Here are the addresses of the companies mentioned in this article:
Team Losi, 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400.
Jammin' Jay Halsey Products; distributed by Team Losi.

PIT TIPS

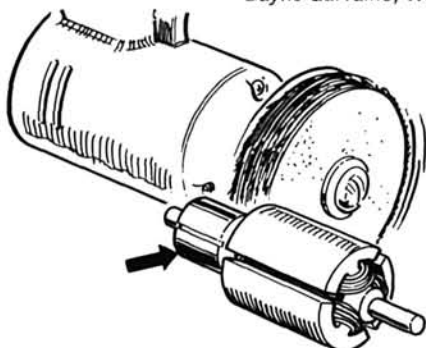
by JIM NEWMAN



BETTER STEERING

If you highly polish the pivot pins, your steering will respond almost as well as if it had ball bearings. To polish the pins, use an electric drill to spin each one in a rag that's soaked with metal polish. Polish until the surface is like a mirror.

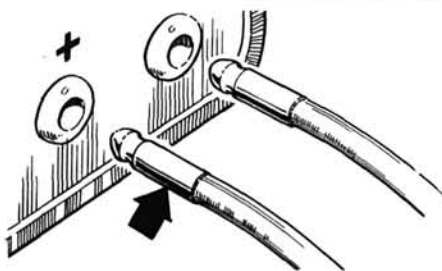
Dayne Garvalho, Waianae, HI



POLISH THAT COMM

Put a little buffing compound on a small, felt buffing wheel, put the wheel on your electric drill, then carefully spin your commutator against the wheel until it's highly polished. Don't overdo it, or you might pit the comm's soft copper, or make it out-of-round. Wash the polished comm with motor cleaner to remove dirt and buffing compound.

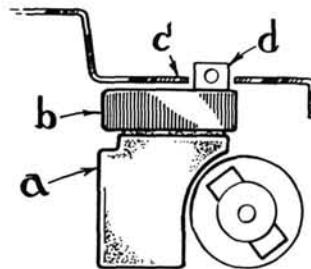
Dave Bornack, Itasca, IL



BULLETS AND BANANAS

If you don't have any banana-type plugs, but you have a few old bullet-type connectors that come with some motors, use them. You'll find that they fit the banana receptacles perfectly. Just be sure to observe correct polarity.

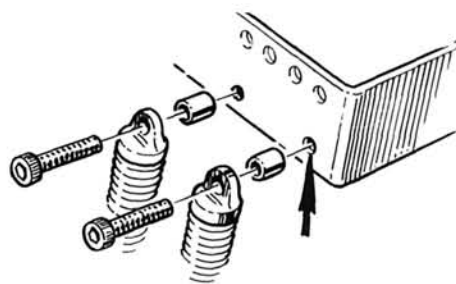
Marbenn Cayetano, Harker Heights, TX



LX-T ESC COOLING

To keep the ESC in your LX-T cool, try this. Take the old rear body mount off the transmission case (a), and mount the ESC (b) on top of the case with servo tape. Cut a hole in the top of the body (c) to let the heat sink (d) poke through to allow air to flow over the fins. You can re-route the ESC wires through the shock tower.

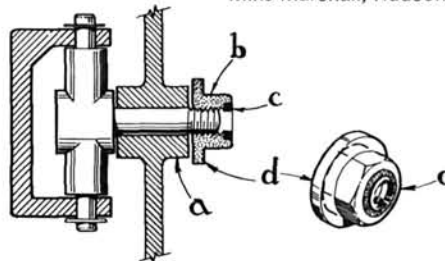
Jagatjit Dhillon, Saskatoon, Saskatchewan, Canada



CLOD MOD FOR SHOCKS

If the oil-filled shocks you bought for your Clod are a little too short, drill new holes, lower in the sides of the tub. As shown here, you might need some new spacer tubes.

Mike Marshall, Hudson, NH

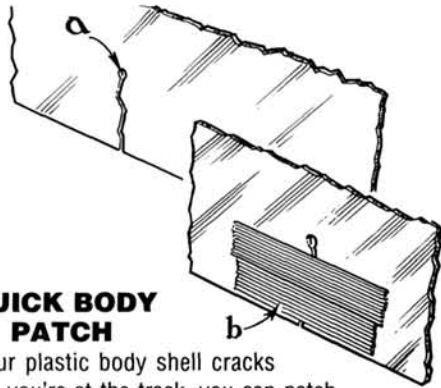


LX-T SHORT AXLES

If you've had a problem locking the wheels on your LX-T's axles, this could be the solution. If the wheel (a) prevents the locknut (b) from going all the way onto the axle, the nylon locking insert (c) won't be able to do its job. File the flange (d) off the nut, then reverse the nut on the axle. The locking insert will now be able to grip the axle threads.

Jim Marshall, Milpitas, CA

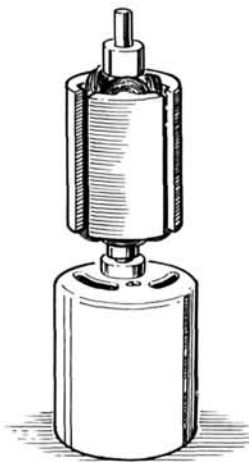
PLEASE NOTE: be sure to print your name and full address clearly on every letter and sketch you send to "Pit Tips." We can't publish many good tips because we don't have the senders' names or addresses.



QUICK BODY PATCH

If your plastic body shell cracks when you're at the track, you can patch it quickly. Drill a 1/16-inch hole at the end of the crack to stop it from lengthening, then stick strips of nylon-reinforced strapping tape over the crack, inside the shell. Apply glue to make the repair permanent, or wait until you're back at the shop, and make a more acceptable repair.

H.L. Weaver, Los Lunas, NM



ARMATURE JIG

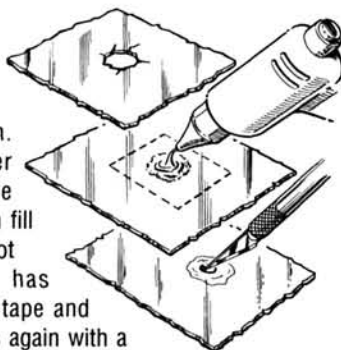
When you remove the armature to clean it, support it on the empty motor can while you spin it and spray it with motor cleaner. Stick a couple of lumps of modeling clay on the bottom of the can to prevent it from moving.

Steven Lam, Alhambra, CA

MOUNTING-HOLE FIX

Mounting holes sometimes crack and widen. To restore them, cover them with tape on the inside of the body, then fill the depressions with hot glue. When the glue has cooled, peel away the tape and carefully open the holes again with a sharp knife.

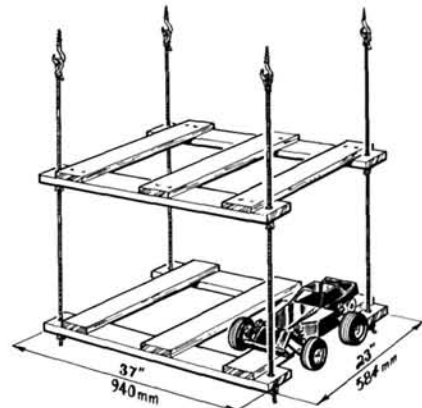
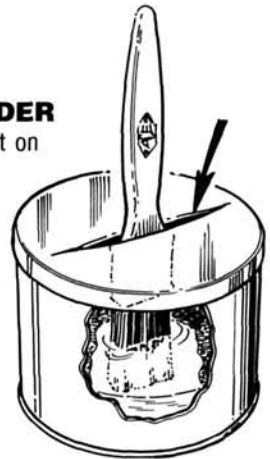
Chris Dilschneider, Calgary, Alberta, Canada



PAINTBRUSH HOLDER

If you let your paintbrush rest on its bristles in a can of thinner, they'll become deformed. To avoid this, use a can with a plastic pop-off lid; slit the lid, then trap the brush handle as shown. The bristles will clear the bottom of the can.

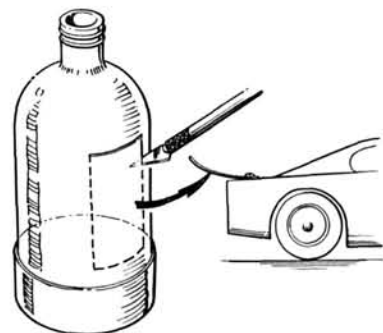
Eric Shoup, Toledo, OH



HANGING STORAGE

Made of 1x2 1/2-inch wood and suspended by heavy cord, this storage rack may be hung from the basement ceiling beams. The shelves are spaced and supported by knots. If you add an extra slat to the bottom shelf, this rack will accommodate seven cars with their suspensions relaxed (wheels hanging).

Richard Miller, Enfield, CT



FREE WINGS

Recycle your 2-liter bottles by using them to make wings. Cut out a wing, and attach it to the body or the car's frame with screws or servo tape.

Karl Gelles, Fairfax Station, VA

Radio Control Car Action will give a six-month subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send a rough sketch to Jim Newman, c/o Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Radio Control **CAR ACTION** **TOP TEN**

IF YOU'RE a longtime *Car Action* reader, you may notice that the categories in this year's edition of the Top 10 are a little different from those of previous years.

We've divided the 10 Best Cars section into categories for racing cars and fun cars. We did this because the R/C car hobby has become so diverse that 10 categories simply weren't enough to cover the incredible number of vehicles available; we wouldn't want to leave anyone out!

Top 10 Gizmos and Top 10 Bolt-Ons from last year's list have been combined to form the new Top 10 Technological Innovations

category. We think that this new title is much more flattering to those who have been chosen, for these products are being honored for their originality and significance in the hobby marketplace.

We've put a lot of thought into our choices, and we sincerely hope that you agree with our decisions, because these truly are the best of the best.

race cars

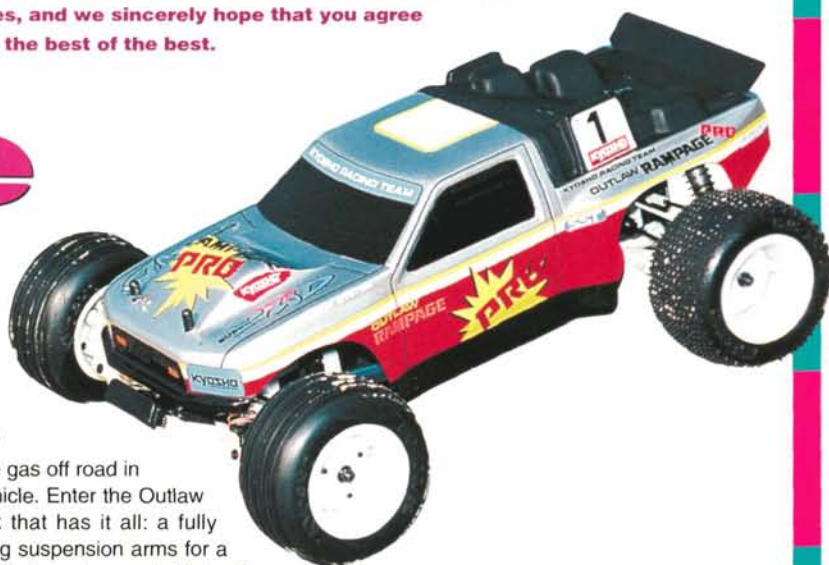
1/10-Scale Gas Off-Road

KYOSHO OUTLAW RAMPAGE PRO

Although Kyosho was the first to offer 1/10-scale gas off road in the U.S., its lineup lacked an all-out racing vehicle. Enter the Outlaw Rampage Pro, a 1/10-scale nitro racing truck that has it all: a fully sealed gearbox with a racing-type ball diff; long suspension arms for a wide stance; a slipper clutch that can be used with Losi's

Hydra Drive; and a blue-anodized, aluminum chassis for good heat dissipation.

Prototypes of the Outlaw Rampage Pro have been faring quite well on the racing circuit, and they appear to be holding their own against the conversion trucks as well as the production racers.



1/10-Scale Dirt-Oval

COBRA NEMESIS

Cobra's new Nemesis dirt-oval racing car is appealing for several reasons. First and foremost, it has large-volume, oil-filled shocks that are a snap to build and tune. Also, it has an innovative "top-loading" differential that makes rebuilding much easier, and it comes standard with full ball bearings and titanium turnbuckles.

The Nemesis is also very competitive on the track. At the '93 NORRCA Dirt-Oval Nationals, 10 prototypes entered, and nine made A-Mains! The Nemesis is available in sprint-car or wedge versions, as well as in a "sport" model that's designed for budget racers.



1/10-Scale 4WD Off-Road

YOKOMO YZ-10

Picking Yokomo for our Top 10 list seems to be a tradition. The new YZ-10 makes the cut this year for its stellar performance at the '93 IFMAR World Championships where, driven by Yokomo's Masami Hirosaka, it dominated the 4WD class to take the top qualifying spot and the overall win.

The new YZ-10 is the first production 4WD to feature a kicked-up chassis for better handling on bumpy tracks, and it has new, narrow, molded front and rear bulkheads that allow the use of longer suspension arms. Did we mention that it's the World Champion?

1/10-Scale Truck

TEAM LOSI LX-T

Losi's electric stadium racer once again makes our list as top truck. It's not any one thing that makes the LX-T such a delight to build and drive, it's just that, as a package, this truck works!

Attention to detail is apparent with this kit. The molded

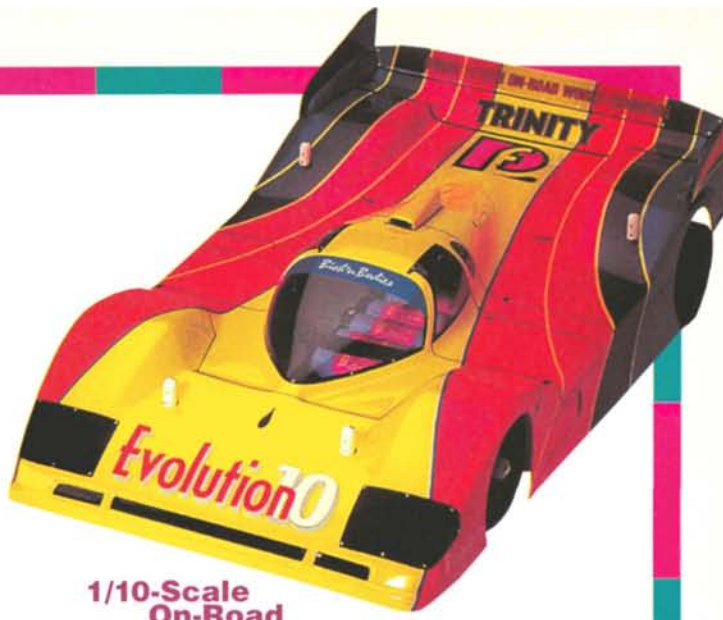


1/12-Scale

TRINITY REVOLVER

Trinity has made quite a splash with its new line of on-road cars—both on the track and on our Top 10 list! The Revolver, in 12p and 12ss form, tops this category because of its impressive list of wins in '93, which include two ROAR national championships and a stunning victory at the prestigious Cleveland Indoor Champs.

Both Revolvers come with Trinity's Reactive Caster front suspension for quick and easy adjustment of caster and camber, and both rely on a single, pressurized shock for rear damping. The 12p is designed for 4- or 6-cell roadcourse racing, and the 12ss allows you to mount all six cells on its left side for super-speedway racing.



1/10-Scale On-Road

TRINITY EVOLUTION 10

The Evolution 10 has pulled off the crime of the century; it has stolen major wins at virtually every big race in '93. In addition to its numerous national titles, the EV10 and the EV10ss are the defending IFMAR and PROCAR World Champions.

Such a record is no mere fluke. The EV10—oval or roadcourse version—is one of the most advanced designs available with its versatile, Reactive Caster front suspension, Triad rear shock system and high-quality graphite chassis. New for '94 is a version of the EV10ss with the motor mounted on the left side of its rear pod for better weight distribution.

chassis and suspension are topnotch and just about the stiffest in the business. Add this to Losi's excellent

Double-X transmission (which now comes standard) and Hard Body shocks, and there's little terrain that can't be tamed. Great instructions and tuning tips add to the fun!

TOP TEN

race cars



1/10-Scale Off-Road

TEAM ASSOCIATED TEAM CAR

'93 was a banner year for the venerable Team Car. In the talented hands of Brian Kinwald, it swept the Modified class at the ROAR Nats and took top honors at the '93 IFMAR World Championships against a full field of heavy hitters and the very latest, most sophisticated racing hardware imaginable.

Though it appears unchanged since its introduction, the Team Car has undergone continual upgrading through the years. Small improvements, such as Teflon shock seals and shock pistons, light aluminum axles and more effective suspension geometry ensure that the Team Car will remain competitive for years to come.

**1/10-Scale
Gas On-Road**

SERPENT IMPACT

The Impact is a stylish blend of 1/10-scale practicality and 1/8-scale performance. Resembling a 1/8-scale car more than a 1/10-scale car, the Impact features an attractive upper and lower aluminum-plate chassis for better rigidity and heat dissipation. This .15 engine-powered racer also comes with an easy-to-set 2-speed tranny, full bearings, an adjustable ball diff and an effective disk-brake system.

Serpent is putting a lot into the burgeoning 1/10-scale gas segment, and it shows in the quality of their kits and their excellent products and technical support.



1/8-Scale On-Road

BMT 933S

We voted unanimously for the BMT in this category. It's a three-time World Champion (piloted by team driver Lamberto Collari) and a five-time European champion. It's interesting to note that the 933S that you can buy is the same as that of the BMT racing team.

Some notable features of the 933 "Austin Light" include a lightweight, Ergal 55 T6 aluminum chassis and radio plate, an efficient 4WD system with easy-to-adjust, 3-speed transmission and a trick, five-shoe Metalox clutch. The 933S is for those who want ultimate performance from a box-stock car.



**1/8-Scale
Off-Road**

MUGEN ATHLETE

Mugen's new buggy tops our charts this year, not only for its performance (driven by Matt Ledger, the Athlete took the top spot at the '93 Kyosho/Car Action Mid-Atlantic Gas Challenge), but also for its many innovative features.

The Athlete has been designed to be easily maintained and tuned. A molded, dust- and moisture-proof box holds your receiver, and segmented gearboxes allow you to quickly remove the new, smaller, aluminum-housed gear differentials. Fully independent, 4W wishbone suspension and purple-anodized, oil-filled shocks combine to give the Athlete sure and stable handling. The result is a car that 1/8-scale off-road fans are sure to enjoy—on the track and on the workbench!

fun cars



TRAXXAS 1/6-SCALE BUGGY

This is one of the coolest things we've seen in a while. If big is better, this 1/6-scale beast from Traxxas—powered by a 26cc Mitsubishi gas engine—is the class of the field. The entire car is built on a tough aluminum frame, and it features fully independent suspension and large (what else?) oil-filled shocks at all four corners. This buggy is nearly 3 feet long and weighs in at just over 22 pounds!



KYOSHO INDYCAR

It's back to basics with Kyosho's 1/10-scale version of Arie Luyendyk's '93 Indy polesitter—the Target/Scotch Lola

T9300. Designed as an inexpensive way to get into R/C cars, the Kyosho Lola also performs surprisingly well, mostly because of its light weight and effective suspension. A molded, multi-piece chassis provides rigidity, but it's flexible enough to prevent breakage during crashes. Floating kingpin front suspension and a pivoting rear T plate/

friction damper rear suspension smooth out the bumps, and a Le Mans 05 stock motor comes in the kit.

TAMIYA HONDA CIVIC



Here's another innovation from Tamiya. Most full-size cars are front-wheel drive, as this produces better foul-weather traction and minimizes the number of driveline components. The Tamiya Castrol Honda Civic (and the Mugen Civic) feature not only front drive, but they also have independent suspension, oil-filled, coil-over shocks, full interiors and very realistic Honda Civic bodies. Elaborate decal sheets and great directions allow you to achieve fantastic results—even if you're not a wizard with paint!

MRC RTR THUNDER KING

This is the "fun" category, and certainly nothing fits it like the Thunder King RTR (Ready To Run) from MRC. This big truck comes fully assembled with an installed Futaba Magnum Jr. radio and all support gear. Take it out of the box, paint the body, charge your battery and off you go!

The Thunder King's impressive features include four aluminum-bodied, oil-filled shocks; a durable aluminum chassis; and a fully sealed, ball-bearing-supported transmission with a racing-type ball diff and adjustable friction-slipper clutch.



TAMIYA KING HAULER

If you're like us, you've always dreamed of driving a big rig—as the biggest thing on the roadway, you get respect!

Well, life on the road isn't all it's cracked up to be, but Tamiya's awesome King Hauler truck may satisfy the 18-wheeler in you.

This 1/4-scale rig is a rolling tribute to Tamiya's incredible design and manufacturing capabilities. A super-detailed cab sits atop a scale-looking "ladder" frame. Even the rear wheels are suspended from tiny leaf springs, just like a full-size truck—incredible. Also, Tamiya makes a terrific, 3-foot-long trailer to accentuate the Hauler.



TOP TEN fun cars



KYOSHO HANGING ON MOTORCYCLES

Until now, R/C motorcycles have been missing one important ingredient—rider involvement! On a full-size bike, the rider leans to alter the center of gravity. On Kyosho's new Hanging On $\frac{1}{8}$ -scale motorcycle, when you steer, the rider leans into the direction of the turn, just like the real thing!

Among the more interesting features of the Hanging On bike is a real chain drive and front and rear damping.

It's available as a Suzuki RGV and a Honda NSR 500. A special "RS" unit, which incorporates the receiver, servo and speed controller, is needed to run the bike.



KYOSHO GO-KART

Now it's time for something completely different. Kyosho's $\frac{1}{4}$ -scale, nitro-powered Go-Kart was a big hit at the '93 Chicago RCHTA show and is sure to be equally successful with R/C enthusiasts. Powered by an included .10 FP O.S. engine, the Kart's most outstanding feature is its driver, whose hands and head move with the steering wheel and front tires. A flip-top fuel tank, a chain drive and a single disk-brake system round out the Kart's impressive features.



BRP'S OVAL OUTLAWS

Bud Bartos is nothing if not creative, and his latest invention— $\frac{1}{18}$ -scale Oval Outlaws—took us by complete surprise. These little suckers are powered by four AA Ni-Cds and can run as long as 25 minutes on a single charge. You can use the radio gear and electronics (transmitter, receiver, servo and ESC) from your $\frac{1}{10}$ -scale car. Available as a stock car or an outlaw wedge, the Oval Outlaws bring the fun of R/C car racing to nearly any smooth surface—even the kitchen table!

BOLINK DIGGER

Named after a popular toy dog of the '70s...just kidding. Bolink's Digger is a beginner's delight with its simple, yet rugged, fiberglass chassis and "bulletproof" drive train topped off with a VW Beetle body. The fact that it has no suspension actually enhances the fun quotient of the Digger as it bounds and rolls—always managing somehow to land on its wheels! With the help of a built-in wheelie bar, a deft driving hand yields awesome wheelies! The Digger is truly a fun ride in a "retro" fashion.

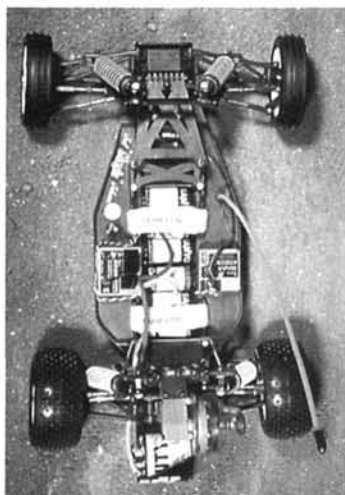


TRAXXAS NITRO 10 BUGGY

Based on the popular Nitro Hawk gas truck, the 2WD Traxxas Nitro 10 buggy is a serious off-road machine. It features a functional molded roll cage—just like a real desert racer—and is powered by an Image .12 engine. An aluminum tub-type chassis makes it sturdy and helps dissipate engine heat to keep things running cool.

The factory-assembled Nitro 10 buggy is available with or without installed radio gear and a transmitter.

technological innovations



TEAM LOSI DOUBLE-X

Top qualifier at the '93 IFMAR Off-Road World Championships, the Team Losi Double-X, has brought 1/10-scale 2WD racing buggies to the next level. This car is designed to be user-friendly; easy maintenance is one of its strong points. The car

features modular front and rear suspension systems that can be serviced easily by removing a few screws. A channeled chassis with raised sides and long suspension arms improves handling. Other hot features include the Double-X tranny, an innovative, universal-type servo-saver system, and a Hydra Drive unit. There are too many cool features to list!



NOVAK ROOSTER REVERSIBLE ESC

Thanks to this speed controller, the days of confusing (and sometimes frustrating) ESC setup and adjustment are over. Targeted at the entry-level driver, the Novak Rooster Reversible was designed for simplicity. To get the Rooster up and running, press the setup button until the LED light is solid red, release it, pull full throttle on your radio, push full reverse, and you're ready to run. Most of the time, you only have to take the Rooster out of its box, pop it into your car, plug it in and go; you don't have to mess with anything!



KO PROPO EG STARTER SYSTEM

Simplify starting your gas engine by eliminating clunky starter boxes, pull-starters and glow-plug drivers. Replace them with a small gearbox, an electric motor and a glow-plug harness—all of which are mated to the engine. Plug the included hand-held starter unit into the connector harness, push the starter button, and the system powers the glow plug and electric motor and kicks the engine to life. The EG starter weighs 3.75 ounces, and the hand-held unit is powered by a 6-cell pack with a Tamiya connector.



KYOSHO LAP BOY

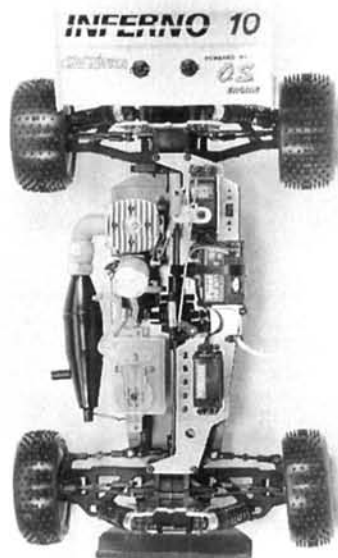
By placing the Kyosho Lap Boy's memory unit into your R/C car, you can enjoy automatic lap timing. The Lap Boy works by bouncing an infrared beam off a special, reflective tape that you place on the track. The memory unit records the data. When you've finished running your car, just download the memory unit to a display unit; the memory unit reveals the date, lap time, record time, total time, best time and average time. All this information can be transferred to paper using an optional printer unit. It's a good system that allows you to compete against yourself, test your driving skills and gauge the effectiveness of certain setups.

COBRA POWER FEED

Use Team Cobra's Power Feed with a commutator cutting lathe to make cutting modified-motor comms easier "while getting a closer, cleaner shave" (or a more accurate cut). The Power Feed is hooked up to a 12V power supply and accurately controls the movement of the lathe's cutting bit and the speed of the motor that spins the armature. The Power Feed doubles as a variable power source that's perfect for breaking in motors or driving slave motors for other applications.



technological innovations



KYOSHO INFERNO 10

The Kyosho Inferno 10 is a scaled-down version of the Championship-winning 1/8-scale Inferno. The car has a sturdy aluminum chassis, is equipped with three diffs and is powered by a .12 O.S. CZ-R. Kyosho also makes the vehicle more affordable by offering molded plastic shocks and bushings instead of bearings. The car could start a new wave of the future in 1/10-scale off-road gas.

VICTOR ENGINEERING IQ-TRACKER

Wanna know what's going on with your R/C car? Well, weighing in at 0.6 ounces, Victor's IQ-Tracker is like having an onboard computer. The unit works with any speed controller; simply attach the Tracker's leads to your battery before you hit the track, and it will record elapsed time, consumed battery capacity in mAh, average current (amps), average voltage, peak and lowest current (amp draw), present current, present voltage, rpm and temperature. Download the Tracker into any digital voltmeter or IBM-compatible PC with DOS 2.0 and higher, and all the information will be immediately displayed.



TRINITY EX-TECH MODIFIED MOTORS

The EX-Tech series of motors feature two new can styles (one is fully enclosed and the other has three venting holes); a new style of brush hood that has special cooling heat sinks that are attached to the brush hoods (so proper alignment is always assured); and Trinity's new 5.0 wet magnets. Although the motor comes with standard (vertical) hoods, you can easily bolt Trinity's lay-down brush hoods into the endbell. The motor's armature has several enhancements,



such as a new internal design that allows the comm to attain higher rpm, and the armature blank has more space so that more wire can be used for higher efficiency.



MIP CVD JOINTS

MIP's Constant Velocity Drive joints (CVDs) are designed to last up to six times longer than standard universals or dogbones, and they're completely rebuildable. The CVDs offer near-zero backlash, have no binding, and provide positive acceleration.

They feature a black-oxide, rust-preventative finish, and they are hardened for added strength and durability. Are they hot? Team Associated's Brian Kinwald used them on his Team Car to win the recent IFMAR Off-Road World Championship.



TEKIN BC 67 AC/DC CHARGER

In the olden days, the chargers with the best features had to be accompanied by a power supply or a car battery. Well, Tekin Electronics offers desirable options in an AC/DC charger. The microprocessor-controlled BC 67 has all-digital electronics and an LCD display that reads voltage, amps and time. You can time charge or choose from among the three peak-charging modes: Cold Start (CS) for charging a fully discharged pack, Peak (P) for a normal peak charge, and Repeak (P2) to fully top off the cell. The BC 67 will charge six to seven cells at 0 to 5 amps and four to eight cells at 0 to 2 amps. The list goes on and on. It's nice to see all these impressive features in a charger we can plug into a wall socket.

big trucks



JPS ALUMINUM HOP-UPS

Tricking out your Clod or Bullhead with JPS aluminum after-market parts not only strengthens your machine, but it also makes your rig look pretty sharp. JPS offers 6061 T6 aluminum gearboxes that accept stock or after-market gears; axle tubes that accept the stock axle bearings and stock or after-market axles; sharp-looking wheels; and an adjustable servo-saver that fits either their gearbox or the stock unit. You can't go wrong with any of these items for your monster truck.



MRC JUICE PAK

We're always looking for a little more run time from our electric trucks and buggies, right? Well, here's one of the best after-market items for MRC's World Scale trucks and buggies—the Juice Pak. Instead of using a lot of sub-C cells, MRC opted to use a larger 9.6V 2000mAh C-cell pack that gives you more speed and a lot more run time. The Juice Pak comes with a special mounting kit so it pops right in.

THORP MFG. CLODBUSTER BALL DIFFS

One of the most functional after-market products for the Clodbuster and Bullhead would have to be this ball diff from Thorp Mfg. Composed of 72 pieces, this durable,

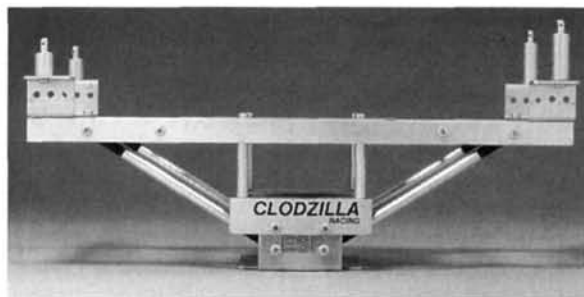


Modular-1 pitch adjustable diff increases the truck's cornering capability and provides a better overall ride. If you plan to modify your truck, add this to your list of goodies.



TAMIYA SUPER BLACKFOOT

The legendary Tamiya Blackfoot—perhaps the most popular monster truck—has been replaced by a refined version—the Super Blackfoot. The truck features a reliable, die-cast-metal, bevel-gear differential; longer front and rear suspension arms; a wider wheelbase; and strong metal dogbones that replace the old, easily stripped plastic halfshafts.



ESP CLODZILLA III CHASSIS

ESP, an innovator in the monster-truck category, has developed an all-new racing-truck chassis. The Clodzilla III 6061 T6 aluminum chassis features an ultra-narrow, low-profile design. Weighing in at 10 ounces, it's currently the lightest monster-truck racing chassis on the market. The chassis has multi-position shock mounts that allow variable shock angles, and it has a special low-centered, battery-mounting tray that keeps the truck's CG relatively low. The chassis also comes with super-low-profile body mounts and a light aluminum radio tray for mounting your receiver and ESC.

TOP TEN big trucks

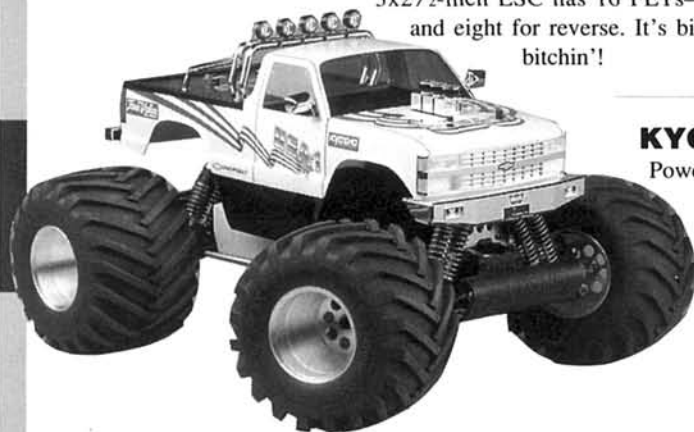


PRO-LINE MONSTER TRUCK TIRES

These are a must for big-tire monster truckers. The "rip it up" V-treads shred dirt with no problems. If you run more motor in your monster truck, these tires will definitely help you get the power to the ground more efficiently. As a bonus, these tires are affordable at \$26.95 per pair.

SCI MONSTER CARD

If you're looking for a trick speed controller for your monster truck, then check out SCI's Monster Card. The Monster Card, which was specifically designed to work in dual-motor monster trucks, can handle 4 to 20 cells and has reverse with linear control at all speeds. It comes with built-in forward and reverse LEDs, a monstrous built-in heat sink and a single potentiometer setup (neutral set point only). The 3x2½-inch ESC has 16 FETs—eight for forward and eight for reverse. It's big, it's bad, and it's bitchin'!



TAMIYA BULLHEAD

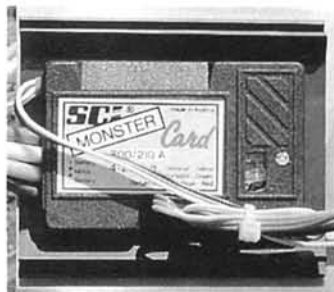
The Bullhead, which is based on the ever-popular Clodbuster, is Tamiya's front-runner in the monster-truck wars. With its impact-resistant polystyrene semi-rig truck body, dual motors, ABS plastic bathtub-type chassis, sealed gearboxes, and 4W steering, the Bullhead is one tough customer. Look for it at car-crushing contests near you!

BENNETT/PDI CLOD-A-LEVER SUSPENSION

This NR/CTPA Championship-winning suspension kit for your Clod Buster or Bull Head gives you more suspension travel, and it comes with stainless-steel torsion sway bars, a unique steering system that includes a gearbox-mounted servo mount, ⅛-inch stainless-steel rods to replace the ladder bars, cantilever shock mounts, chassis braces, all the hardware and



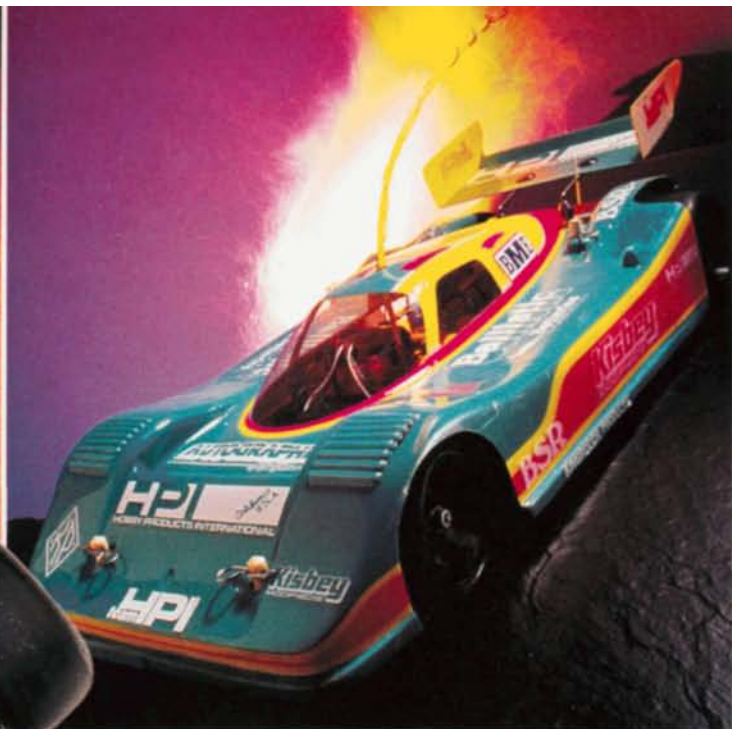
an illustrated instruction book. Best of all, the suspension kit fits all production chassis—from the stock plastic unit to the ESP ladder frame.



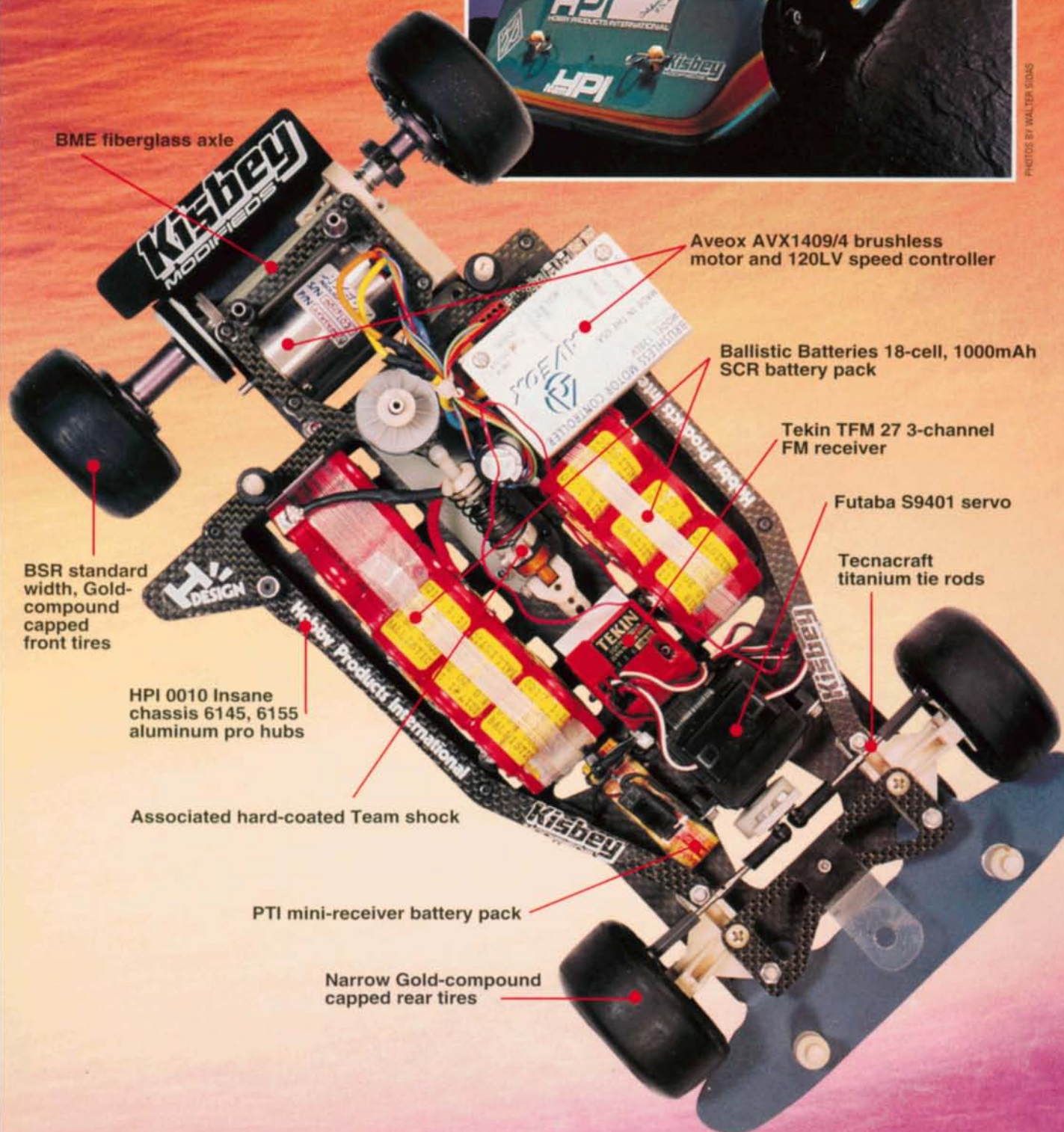
KYOSHO USA-1 NITRO CRUSHER

Powered by a potent .21 engine (which you have to supply), this is Kyosho's gnarliest monster truck. It's based on the durable Inferno chassis, featuring an aluminum chassis, three gear diffs, double-wishbone suspension and oil-filled shocks. When this truck fires up, watch out; it has tons of horsepower, and it doesn't stop for much.

Setting the record straight



PHOTOS BY WALTER SOGAS



INSIDE THE INSANE Speed Run Winner

by GEORGE GONZALEZ

THE R/C THUNDERDROME'S Insane Speed Run is one of the hottest attractions in R/C racing, and there are very few rules; it's basically an "anything goes" race. The goal: the cars must complete one full lap as quickly as possible, and the car with the fastest average speed wins.

The rules are simple enough, but competition in this event is as tough as it comes. The title of "World's Fastest R/C Driver" doesn't come easy. For the second straight year, Team HPI emerged victorious. Joe McGregor piloted his car to a very impressive 87.41mph to break Gary Hamilton's 1992 record and win the title. Congratulations, Joe!

A STRAIGHTJACKET AFFAIR

Competing in the Insane Speed Run takes a lot of preparation, patience, guts and money. The car has to be dialed in to exacting tolerances, and to achieve the perfect combination of power and handling, the motor, ESC and battery combination is critical. The driver must find the fastest line around the track and must keep the car within that line at straightaway speeds that exceed 100mph. An Insane Speed Run car can cost as much as \$1,000 to build, and all it takes is one slight glitch to turn it into a pile of graphite dust.

BUILT FOR SPEED

Joe's Insane car is one of the two prototypes that Gary Hamilton built for the '92 T-drome. The cars were so successful that they went on to become the HPI* Project

RC10LSS Insane Speed Run Conversion Kit (part no. 8010). For more information on this kit, check out the "RC10L Insane Conversion" article in the February '94 issue of *Car Action*.

HIGH-SPEED CHASSIS

The HPI chassis is made of light, high-quality graphite, and it's rein-



To attain the winning speed of 87.41mph, Joe experimented and ran an Aveox brushless motor. Obviously, it worked well. Forward and to the left of the motor pod is the motor's microprocessor-controlled speed-controller system.

pension to do its job properly. At the rear, a chassis brace provides lateral support and strengthens the damper post. In short, the HPI chassis is extremely rigid, and it can handle the extreme G-forces that the Insane Speed Run demands. The HPI chassis is also 1/4 inch longer than the stock chassis, and this

means improved high-speed stability.



A whopping 18, 1000mAh Sanyo SCR cells from Ballistic Batteries power Joe McGregor's Insane Speed Run car down the straightaways at over 100mph!

forced on all sides by graphite braces. The side braces—or side rails—are mounted on aluminum posts and secured to the front suspension arms and to the rear chassis brace; this provides the longitudinal support.

Up front, a brace prevents the suspension arms from flexing and allows the sus-

HIGH-SPEED SUSPENSION

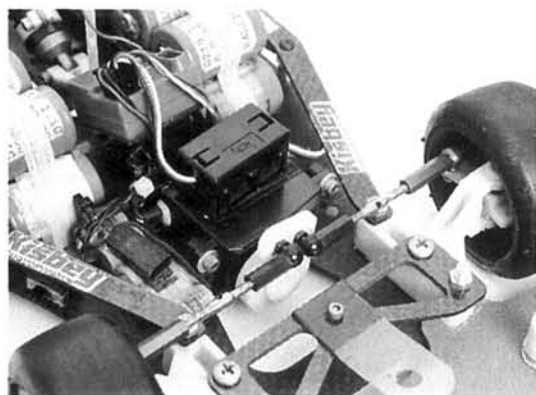
Up front, Joe used the 10L's standard suspension arms outfitted with 0.022-inch springs. In the rear, Joe installed an HPI Aero lower brace to provide a foundation for the rear pod assembly. The HPI lower pod brace is kicked up approximately 30 degrees, and that increases downforce and rear traction.

Instead of the stock unit, Joe used HPI's Pro upper brace, which is lighter than the stock unit and has a unique lubricant reservoir that allows smooth damper-washer operation. Joe opted for HPI Teflon Damper Tape, however, which he applied to the upper pod brace. An Associated* Team Shock provides the damping, and a set of HPI aluminum wing mounts completes the rear pod assembly.

HIGH-SPEED DIFFERENTIAL

Joe replaced the original 10L's axle with a BME* fiberglass axle, which is stronger and

INSANE SPEED RUN WINNER



A HPI suspension-arm brace increases front-end security, while a Futaba S9401 servo handles the steering chores.

weighs less than the stock unit and runs extremely true. For reasons of quality control, the axle's date of manufacture is stamped on it. For ultra-smooth diff action, Joe put a set of HPI ceramic diff balls into a Kimbrough* 64-pitch spur gear, and a set of Kimbrough diff covers keeps out the road dust. To reduce the driveline's rotating mass, Joe used a set of HPI aluminum pro hubs.

PANCAKES, ANYONE?

Joe used the Associated narrow Jaguar body he used at the '92 T-drome. It's amazing how this low-slung, pancake body has lasted two full seasons of Insane Speed Run practice without a single crack, but Joe is a professional driver. The design of this aerodynamic body is ideal for the Insane Speed Run. To provide the necessary downforce and stability, Joe used an HPI Pro Aero wing with HPI wing buttons and quick-fit wing wire. Frank Killam Race Paints custom-painted the car in HPI's colors.

NUCLEAR POWERPLANT

A Tekin* TFM 3-channel mini-receiver picks up the signals from Joe's Airtronics* Caliber 3P transmitter. A Futaba* S9401 servo provides the steering, and Joe also installed a large Kimbrough servo-saver. He ties the steering system together with a set of Tecnacraft* titanium tie rods and Team Losi* ball cups. To ensure a constant power supply for the receiver and servo, Joe installed a PTI* mini-receiver battery pack made of five, tiny, 50mAh Ni-Cds.

To obtain the tremendous power needed to compete in this event, Joe used 18, 1000mAh Sanyo SCR cells from Ballistic Batteries*. These cells are smaller and lighter than standard sub-C cells, but they put out the same power. The weight advantage they offer is a great benefit, but they don't have the capacity of standard sub-Cs. Their shorter run time makes them useless for 4-minute

heats, but perfect for the Insane Speed Run.

The awesome horsepower of Joe's car is provided by a state-of-the-art, microprocessor-controlled, Aveox* brushless motor and speed-controller system. Brushless motors—otherwise known as “moving-magnet motors”—have been around for many years, and they're fairly common in electric-powered model aircraft. To the best of my knowledge, however, the '93 T-drome was the first sanc-



When you reach speeds in excess of 100mph, you need a tire that can hold up under all that stress. Joe's tire of choice?—BSR Gold-compound capped tires.

tioned R/C race in which this system was used. The brushless motor in Joe's car is about the same size as a standard, moving-coil design, .540 motor, but it puts out three times the power—amazing!

As well as their obvious power advantage, brushless motors have many other advantages compared with standard motors:

- They're more efficient.
- More of the battery power goes to the tires, and less is wasted as heat.
- There are no brushes or commutators to wear out, so a brushless motor has the same out-of-the-box performance for thousands of runs.
- Brushless motors are more reliable; the only moving parts are a center shaft to which is attached a permanent multi-pole magnet and two precision ball bearings (on either side).

Aveox brushless motors aren't compatible with standard FET speed controllers, so Joe mated his with an Aveox 120LV controller. The 120LV is basically a microprocessor-controlled voltage switcher that interprets signals from special electronic sensors that are fixed to each motor winding. The sensors detect the magnet's position in relation to the windings, and it tells the controller which

winding to charge. The 120LV can handle up to 20 cells and is designed for high-power applications.

The Insane Speed Run is the only sanctioned event that allows the use of the Aveox brushless motor and ESC. Brushless motors aren't allowed in any other form of sanctioned racing because they cost far more than the \$80 motor-price restriction imposed by NORRCA and ROAR, and they aren't widely available.

RADICAL RADIALS

Tire selection is critical for the Insane Speed Run. I can't estimate the tires' rpm at speeds in excess of 80mph, but the numbers must be pretty mind-boggling. To prevent the tires from exploding at high speeds, they must be capped and have a solid core, so Joe installed a set of BSR* Gold-compound, capped tires—standard-width fronts and narrow rears. Because the tires rotate in the same direction as the seam, they're less likely to fly apart at high rpm. (At the '93 T-drome, Joe used a set of BSR capped tires to win the 200-lap R/C Car Action Superspeedway Shootout.)

100MPH OR BUST

So, what's next—rocket-powered R/C cars? Who knows, maybe we'll see an RC10LSS powered by a dozen Estes model rocket engines! One thing is for sure: the Insane Speed Run is the greatest spectacle in R/C, and the competition seems to get faster every year. Joe McGregor and the folks at HPI are already preparing for the next Thunderdrome, and they won't rest until the 100mph barrier has been broken.

**Here are the addresses of the companies mentioned in this article:*

HPI, 22600-C Lambert St., Ste. 904, El Toro, CA 92630; (714) 837-3250.

Associated Electrics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9337.

BME, P.O. Box 2066, Brick, NJ 08723.

Kimbrough Products, E. St. Andrews Place, Unit F, Santa Ana, CA 92705; (714) 557-4530.

Tekin Electronics, 940 Calle Negocio, #140, San Clemente, CA 92673; (714) 366-9016.

Airtronics Inc., 11 Autry, Irvine, CA 92718; (704) 830-8769.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

Tecnacraft, 1335 B Dayton St., Salinas, CA 93901; (408) 422-7466.

Team Losi, 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400.

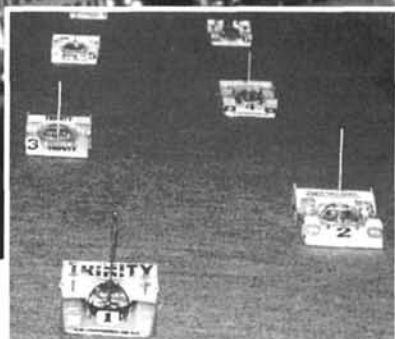
PTI, Box 950, Pilot Mountain, NC 27041; (800) 833-1375.

Ballistic Batteries, 11725 Gerald Ave., Granada Hills, CA 91344; (818) 363-1625.

Aveox Inc., P.O. Box 1287, Agoura Hills, CA 91376-1287.

BSR; distributed by Bolink R/C Cars Inc., 420 Hosea Rd., Lawrenceville, GA 30245. ■

The smoking gun



Waiting for the horn to start the Modified A-Main, Johnson's Trinity Revolver 12 sits on the pole, followed by Mike Lufaso's Associated 12L (no. 2) and Mike Blackstock's Trinity Revolver 12 (no. 3).

1993 Cleveland Indoor

IF THIS IS Cleveland, it must be Thanksgiving. Once again, all the top 1/12-scale teams and drivers descended on Cleveland, OH, for the annual NORCAR U.S. Indoor Championships.

For car manufacturers, there were basically four races to win: Stock and Modified TQ and, of course, the Championship title in both divisions. In the past, we've seen dominance by Associated and some valiant efforts—and wins—by Corally. This year, Trinity has been on a roll in the car-building market, so I knew that this would be an interesting event. It's probably the most important 1/12-scale race of the year.

by JOHN THAWLEY



Once again, the Cleveland Holiday Inn hosted the annual NORCAR U.S. Indoor Championships. Drivers came from as far as the West Coast and Canada to compete.

PHOTOS BY JOHN THAWLEY

MODIFIED

Fin.	Qual.
1	1
2	3
3	4
4	5
5	6
6	2
7	9
8	8
9	7
10	10

STOCK

Fin.	Qual.
1	2
2	1
3	3
4	4
5	5
6	9
7	8
8	7
9	10
10	6

TECNACRAFT
1/12-SCALE
HUB SET

TRC YOKOMO
FOAM TIRES
(3538)

MACHINED, POD
SIDE PLATES

5-CELL,
50MAH
RECEIVER
PACK ON
CUSTOM
MOUNT

NEW,
LONGER
T-PLATE

NOVAK
NER-3FM
RECEIVER

TRINITY
PUSHED
PANASONI
P-170S

NOVAK
410-HPC
ESC

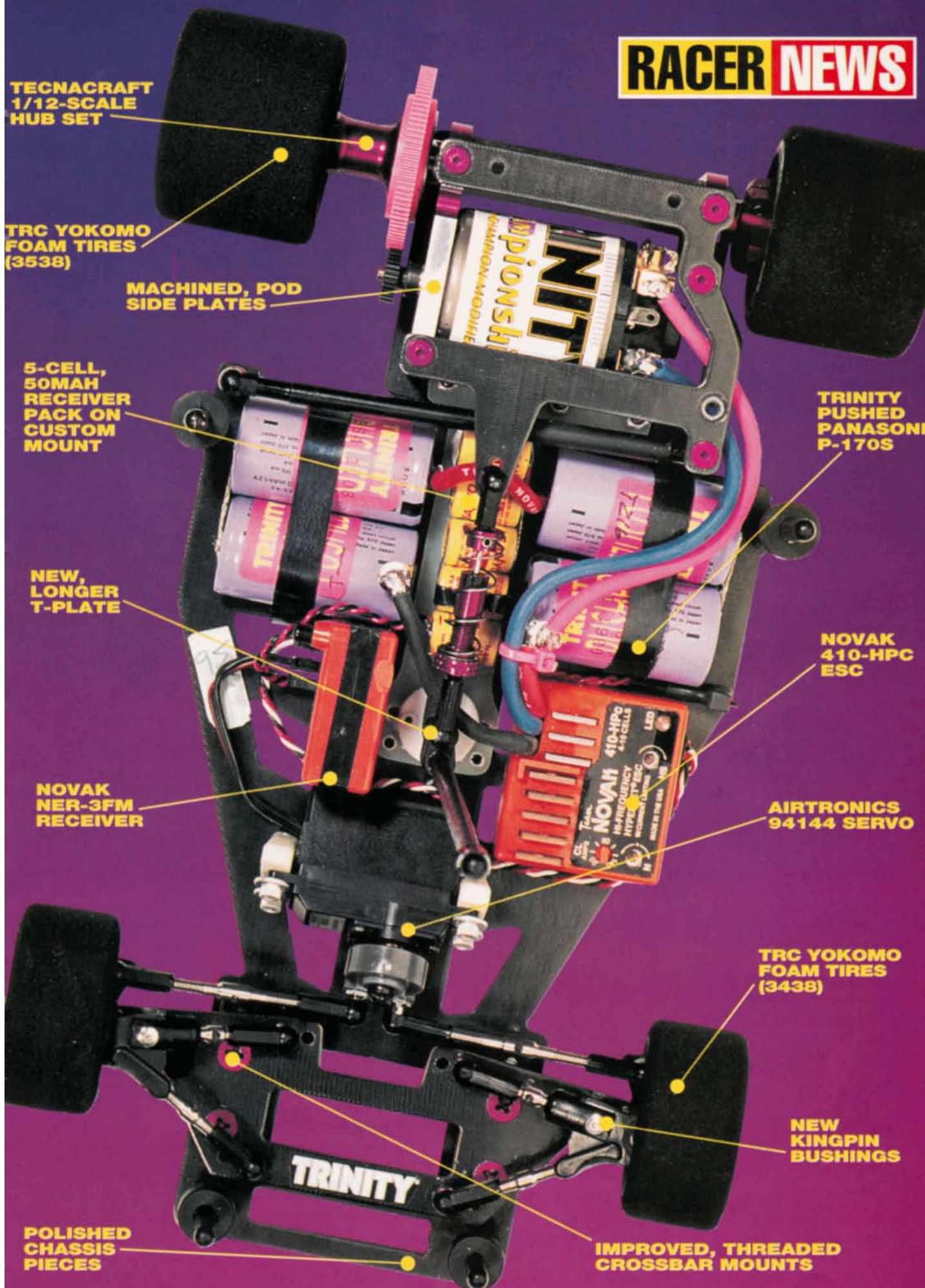
AIRTRONICS
94144 SERVO

TRC YOKOMO
FOAM TIRES
(3438)

NEW
KINGPIN
BUSHINGS

POLISHED
CHASSIS
PIECES

IMPROVED, THREADED
CROSSBAR MOUNTS



FOR 1/12-SCALE racers, no event is as significant as the Cleveland Indoor Championships. Joel Johnson is no stranger to the Indoor Champs; he has participated in every one since 1982, and he has won the Modified event an unprecedented seven times.

Joel's latest weapon of choice is the Trinity Revolver 12 CE (Carpet Edition)—a 1/12-scale, 4-cell-only, electric road racer. Basically, it's identical to the Revolver 12p, but it has a slightly shorter chassis that has slots only for four cells instead of six.

CLASSY CHASSIS

To minimize friction when the chassis touches the track's carpeted surface, Jim Dieter polished the chassis of Joel's Revolver using rouge and a buffing wheel. The surface looked so nice that Jim polished the rest of the chassis, the front suspension plate, and the upper and lower pod plates to give them a glossy look, too.

ZIPPY FRONT SUSPENSION

Specially made front crossbar mounts made of black Delrin prevent the crossbar from shifting in the event of a collision. The mounts are threaded to accept 8-32 flat-head screws. There's talk of these mounts becoming a Magic Motorsports accessory item. The front kingpins in Joel's car ride inside new bushings instead of through the crossbar's graphite material. Suspension action is much smoother, and you can replace the bushings when they're worn instead of having to buy a new and more costly crossbar.

The carpet track at the Indoor Champs always provides racers with ample traction. Actually, according to Joel, it can be compared with driving on fly paper! The hot setup is to take away as much of your car's steering as possible. Joel set his front suspension with Trinity's .024-inch front

springs and 2 degrees of negative camber on each wheel; 2 degrees of caster and without Reactive Caster, which would increase steering.

REAR SUSPENSION

For the rear suspension, Dieter devised a special, longer T-plate that "softens" the rear end to increase its traction and take away even more steering. (This plate will soon be available from Trinity as an option.) Joel found that, owing to its incredible traction, his car would lift its inside rear tire when cornering. This could be prevented by lowering the car's roll center; so Dieter cut down the balls on which the T-plate pivots.

A small graphite plate between the two pivot-ball mounts holds the tiny battery pack (five 1.2V, 50mAh cells) that powers the radio system. The car's rear suspension remains in stock configuration. Joel filled the shock with 20WT Trinity shock oil, and he coated the inner piece of the friction-damper tube with a combination of Trinity's 70WT shock oil and RC6009 Silicone Damper Fluid.

The tops of the aluminum motor-mounting plate and the rear pod's left side plate have had approximately .150 inch machined off them. This wasn't done for any performance gain but to allow proper clearance for the low, sleek Protoform P-35 Nissan GTP body. Joel told me that all newer Revolvers will come with lower plates.

WINNING BITS

The Revolver's stock, graphite axle has

been retained. Joel added a set of lightweight, 1/12-scale rear tires from TecnaCraft. The left side hub is clamped to the axle instead of being held by a setscrew, which could mar the axle's surface. You may notice that many of the aluminum parts, including the hubs, the shock and the side plates have been anodized purple. This was done by Joel's friend John LaBue, whom Joel thanks for his work.

The motor/battery combination needed to win a race like the Indoor Champs must provide adequate power yet be efficient enough to last the entire 8 minutes of the race without dumping. Joel used Trinity Pushed 1700mAh Panasonic P-170 batteries and a Trinity EX 3513, 13-turn quintuple-wind motor, which was designed for 4-cell racing. To this he added Trinity 4525 half-cut silver brushes and 40325 light-tension springs. The motor was then set with 15 degrees of timing advance. *[Eagle eyes take note: the motor in the photos is not the motor used by Joel. We received the car directly from Dieter, who didn't have the winning motor in his possession.]*

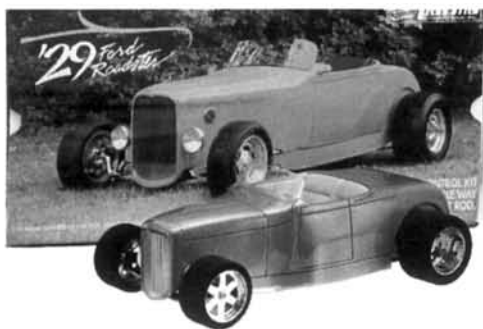
Joel used an Airtronics Caliber 3P transmitter and 94144 servo, and he used Novak electronics, i.e., NER-3FM receiver and 410-HPc ESC. His tires were TRC Yokomo foam rubber mounted on the company's ZR-1 composite wheels (part number 3438 up front and 3538 in the rear).

Congratulations to Joel for his great driving, and to Dieter for designing and building one fine ride. Should they rename the Indoor Champs the "Johnson Invitational"? ■

Joel Johnson's

REVOLVER 12CE

INSIDE THE INDOOR CHAMP



PARMA

'29 Ford Roadster

This kit sets new standards for detail and scale realism. It consists of eight parts: a three-piece headlight unit, an awesome three-piece interior and a two-piece body with a complete undercarriage. Just add a motor, batteries and radio gear, and you'll be ready for serious fun!

Part no.—15110; **price**—\$99.95.

Parma Intl./PSE, 13927 Progress Pkwy., North Royalton, OH 44133; (216) 237-8650.



HOLESHOT Pro Balancer

Now you don't have to rely on clumsy tweak boards or guesswork to determine the correct weight distribution for your vehicle! This weight scale places sensors under each wheel of your car to provide an exact reading through a digital readout. With this information, you'll be able to distribute weight for optimum performance. To ensure consistent performance, you can also record your settings. Remember, it isn't always the fastest car that wins; it's the one that handles the best!

Part no.—6700.

Holeshot Racing Products, P.O. Box 630, Canton, MA 01021; (508) 587-0663.



TRINITY Zip Grip

It's the latest in foam-tire traction compounds! This all-purpose compound works equally well indoors and outdoors, and it won't dry out halfway through a run. It comes in a bottle with a convenient dauber applicator, so you'll never have to get traction compound on your hands again!

Part no.—RC6680;

price—\$6.99.

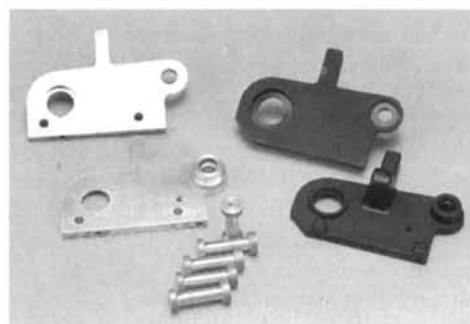
Trinity Products Inc., 1901 Linden Ave. #8, Linden, NJ 07036; (908) 862-1705.

TECNACRAFT Quick-Release Wing Kit

Wing installation is a snap with these quick-release wing mounts that can be bolted to your upper motor plate. Special inserts are mounted on your wing wire with setscrews. To mount your wing, just push the inserts in, and snap them securely into the mounts. To remove it, simply pull back on the release wires and pull it out. No more looking for that Allen wrench!

Part no.—PN 50200; **price**—\$12/pair.

Tecnacraft, 1335B Dayton St., Salinas, CA 93901; (408) 422-7466.



DURATRAX

Low-Cost Upgrades for Gas-Truck Conversion Kits

Fine-tune the performance of your Losi LX-T and Associated RC10T gas truck conversion kits with these three new hop-up parts! The Losi Double-X Diff Plastic Transmission Case Set enables you to use Losi's new Double-X diff assembly with the LX-T gas conversion kit. The RC10T Aluminum Transmission Set increases the durability of the conversion's transmission by replacing the kit's plastic pieces with machined-aluminum parts. The Aluminum Radio Tray Post Set can be used with either gas conversion. The machined-aluminum posts replace the original nylon parts, and they won't flex or strip when the screws are tightened.

Part nos.—DTXC0963, DTXC0964, DTXC0968; **prices**—\$24.95, \$59.95, \$17.95.

DuraTrax/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.

Descriptions of the products shown on these pages were derived from press releases supplied by manufacturers and/or their advertising agencies. The information given is neither an endorsement of the product by *Radio Control Car Action*, nor a guarantee of performance or safety. If you write to the manufacturer about any product described here, be sure to say that you read about it in *Radio Control Car Action*.

Many teams came armed with a slew of team-driver artillery. Tony Neisinger drove an Associated car with Hotshot batteries and CAM motors. Chris Doseck showed up with a CAM-powered Corally SP12G. Flying the colors of Trinity and his new company, CRC, Frank Calandra tooled around with a Trinity Revolver. The Associated camp had Mike Lufaso, Steve Radecky and Jon Orr campaigning Reedy-powered 12LSs. Two surprises were Sean Cochran, driving Skip Starkey's PROCAR 12, and Brett Polivka, running a CAM-powered Corally. Two *not* surprises were Trinity pilots Joel Johnson and Mike Blackstock, who both drove Dieter-prepared Trinity Revolvers.

Particularly interesting was the number of former modified drivers who were returning to stock. I asked around for opinions on this type of move. Batteries seem to be the big issue; they're just too tough to get—killer ones, that is. Before a major race, factory drivers spend a lot of time sorting cells to ensure that they have the best possible numbers. Because they thought they couldn't get cells good enough for modified racing, some drivers sat out a season. This year, they wanted to race for fun. Most thought that stock was a tougher driving challenge from a competitive standpoint. It's not that a stock car is harder to drive than a modified, but with only limited available horsepower, you can't afford driver errors.

MAINS

As is typical of the U.S. Indoor Champs, the ballroom was standing room only during the main events.

• **Stock A.** The grid was set; the spectators were pumped. At the horn, there was a dead silence. I don't think that I'll ever get used to the tense silence that exists at the start of indoor 1/12-scale Main events. It's spooky.

On the first lap, Chad Coppock and Scott Williams came out of the sweeper as if they were fastened together. On lap nine, Williams went to the front. Coppock was right there in hot pursuit.



Williams started to pull away. It looked as though he had the race wrapped up, then disaster struck. Williams "biffed," and that flicked him over a board into a very precarious marshalling spot—an error that cost him 6 seconds, and he dropped back to fifth. Coppock grabbed the lead, and when the dust had cleared, Coppock was the U.S. Indoor Champion. Williams was in second, Chris Mockerman was third and Andy Power in fourth. These drivers had dominated the qualifying all weekend, so it was only fitting that they finished up front, too.

A mean machine! With his Trinity Revolver 12, the talented Joel Johnson took the Modified title, which also happened to be his seventh win at Cleveland.



• **Modified A** was...well, it was a Cleveland Modified A-Main: thrills, spills and more fun than should be allowed. But the outcome was a...uhhh...predictable. The Magic Man, having a magic year, simply gave it a mighty hi-oh c-ya and went out in front to win, as he had done six times here before. The rest of the field did him the favor of running over one another (a likely occurrence on a 4-cell track with so many equally matched cars).

Behind Johnson was a great duel for second. Blackstock, Radecky and Doseck seemed to have a ball—racing hard, but having a good time. Right at the end, Blackstock pulled it out to take second; Doseck took third and Radecky fourth. Joel won with 37 laps in 8:06.86.

As I said earlier, if you're a car manufacturer, there are basically four races to be won: Stock and Modified TQs and, of course, the Championship titles in both divisions. To walk away with three out of four ain't bad, and that's exactly what the new Trinity Revolver did. Congratulations to the NORCAR club for another well-run event.

Champs

Name	Chassis	Motor	Battery	ESC	Radio	Body	Tires
Joel Johnson	Revolver	Trinity	Trinity	Novak	Airtronics	Protoform	TRC
Mike Blackstock	Revolver	Trinity	Trinity	Tekin	JR Remote	Associated	TRC
Chris Doseck	Corally	CAM	Power Push	Tekin	KO Propo	Protoform	TRC
Steve Radecky	Associated	Reedy	Power Push	Novak	JR Remote	Associated	TRC
Frank Calandra	Revolver	Trinity	Trinity	Novak	JR Remote	Protoform	PSE
Mike Lufaso	Associated	Reedy	Perfect Match	Novak	Airtronics	Associated	Yokomo
Sean Cochran	Procar	Genesis	Genesis	Tekin	JR Remote	Associated	TRC
Jon Orr	Associated	Reedy	Panasonic	Novak	KO Propo	Associated	PSE
Barry Baker	Associated	Reedy	Power Push	Novak	KO Propo	Associated	TRC
Brett Polivka	Corally	CAM	Perfect Match	Tekin	Airtronics	Associated	TRC
Name	Chassis	Motor	Battery	ESC	Radio	Body	Tires
Chad Coppock	Wood Racing	H	Advantage Match	Novak	Kraft	PSE	TRC/Yokomo
Scott Williams	Revolver	A	Trinity	Novak	KO Propo	Associated	TRC
Chris Mockerman	Associated	N	Sanyo	Tekin	JR Remote	PSE	PSE
Andy Power	Revolver	D	Stage III	Novak	KO Propo	Associated	TRC
Dave Reiman	Associated	O	PSE	Tekin	KO Propo	PSE	PSE
Mike McMahon	Corally	U	Savage Cells	Tekin	JR Remote	Associated	Corally
Steve Charles	Corally	T	Danny's Choice	Tekin	Airtronics	Associated	Corally
Robert VanWagner	Corally	-	MaxCell	Tekin	JR Remote	PSE	Corally
Peter Maiolo	Corally	-	Perfect Match	Tekin	Futaba	Associated	Associated
Jeff Brown	Wood Racing	-	Stage III	Novak	Airtronics	PSE	TRC

RACER NEWS

Speed Shop



JR REMOTE CONTROL X-756 Radio

The X-756 unites the advanced features that competitive racers demand with the unique feel and control of a twin-stick transmitter. Its features include adjustable-tension stick gim-bals for precise model control, a unique trim-change alarm, trim memory for six models, direct servo control, model naming and PCM/PPM modulation. Selectable function dials allow you to customize switches for easy access to travel adjustment, brakes and the 75-lap timing feature. Experience the power of sophisticated twin-stick control in the palms of your hands!

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.



CUSTOM WORKS Bullet Wedge Body

The Bullet has been unbeatable on high-bite oval tracks across the country! This sleek new body provides maximum rear downforce for today's ultra-fast 2WD cars.

Part no.—9011; price—\$20.

Custom Works, 3720 Easton Dr. #6, Bakersfield, CA 93309; (805) 323-0471.



PARAGON Ground Effects Traction Compound

Ground Effects tire-traction compound now comes in an 8-ounce economy size, making it even less expensive, ounce for ounce. You'll get the unsurpassed performance that racers have come to rely on—and fewer trips to the hobby shop!

Price—\$10.50.

Paragon Racing Products, Dept. CA2, 690 Industrial Cir. S., Shakopee, MN 55379; (612) 496-0091.

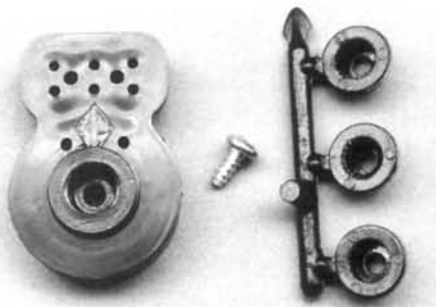
KIMBROUGH

Servo-Saver for Gas Cars

This servo-saver comes with adapters to fit most popular metal servos. Its spring is so strong that it can break the plastic gears used in regular servos. Made specifically for gas cars, it isn't recommended for use in electric vehicles. Use it only on heavy-duty, metal-gear servos, such as Airtronics' 94152; Futaba's S9302 and S3302; Hitec's HS-605BB; JR Propo's S4735 and S605; and KO Propo's PS 1003 FET.

Part no.—124; price—\$5.

Kimrough Products, 1322 Bell Ave., Unit 1-C, Tustin, CA 92680; (714) 258-7425.



HOME - GROWN RACE SPACE!

10 easy track layouts

by Wally Cahill

APRIL 1962: "Hey, Mom, can I have a quarter to go to the movies and stop by the soda shop on the way home and read Mr. McCool's new comic books?" said the short, round-faced, 10-year-old. "Gee, Beaver, that's an awful lot of money just for one day's fun; how about you and Lumpy doing some chores around here to earn the money?" replied one of America's favorite moms. Those words are enough to strike fear into the hardest of boys. As Beaver and Lumpy exited the kitchen with a list of chores, it was only a matter of time before they figured that there had to be a way to have fun without having to work so hard.

Fade to reality. Although it's 32 years later, the same scene is acted out everywhere across the country as young R/C enthusiasts are forced to beg for money above and beyond their allowances so that they can drive their R/C cars at the local track. The price to drive on a track that's owned and operated by an R/C pro shop can range from \$4 to as high as \$7 at some indoor tracks. To some of you, that might not seem like a lot of money, but let's say



OFF-ROAD TRACKS

One of the biggest problems we had while building our track was deciding what to use as track barriers. We found that the traditional PVC pipe was expensive, so we put our minds to work. One way of making these barriers is with old bed sheets. Lay one sheet on top of the other, and draw lines on the sheet that are 8 inches wide for each tube. Allow 2 inches

between each tube so that when you have finished sewing them, there will be room to cut them apart. We filled the tubes with sand; packing peanuts also make good stuffing.

If you live in the city, and fields are nowhere to be found, here are a couple of hints taken from the Mickey Thompson Stadium Racers: find a vacant parking lot to race on, and put foam tires on your R/C car. Get some

2x2s and cut them to whatever width you decide to make your jumps. Next, get a couple of sheets of 1/4-inch plywood and cut them into 10-inch strips that are the same width as your 2x2s. Nail, staple, screw, or glue the plywood to the 2x2s. Voilà! Instant jump! Put these wherever you want, and outline your course with lime, which is available at hardware stores.

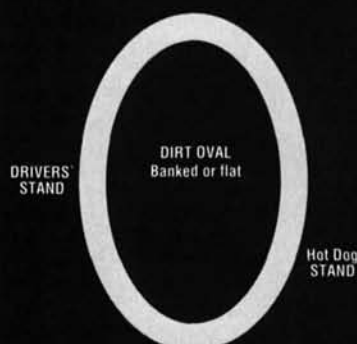
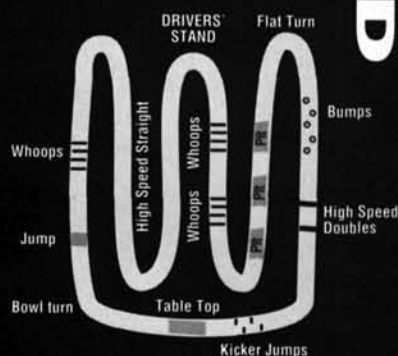
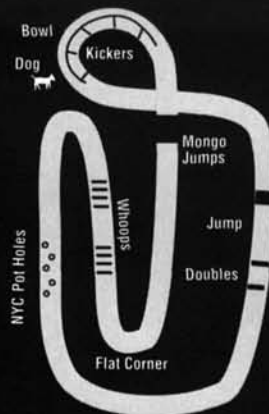
A small board also makes a good track barrier. Dig a channel in the dirt so that two-thirds of the board sticks out.

Place the board in the middle of the channel; pack the dirt tightly around the board; then hose down the area to help settle the dirt.

Wooden jumps are always an option.



OFF ROAD





DRIVERS' STAND

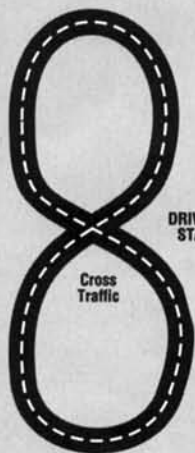


DRIVERS' STAND

Front Straight

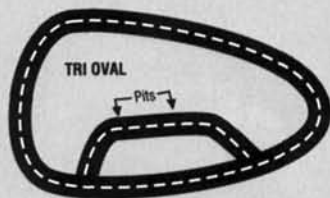
Straight

Dog Leg



DRIVERS' STAND

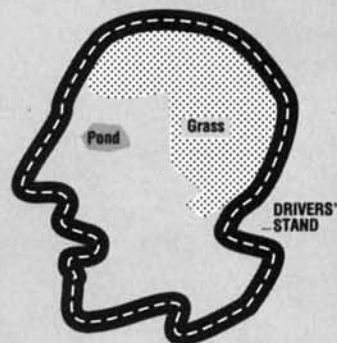
Cross Traffic



TRI OVAL

Pit

Pits



DRIVERS' STAND

you want to drive once a week. That's \$4 a week times 52 weeks in a year—\$208. Yikes! You could buy another car for that amount of money. It might be hard for kids who aren't working to afford an R/C car and the cost of racing it.

ON THE RIGHT TRACK

In my neighborhood, we have a handful of R/C radicals who go through the same ritual every week in order to drive their cars and trucks at the local track. First, there's the bus ride across town, not to mention the six-block walk from the nearest bus stop to the track. Next is food. What 14-year-old can't eat his weight in hot dogs? And don't even mention the temptation of all the speed-for-sale goodies at the store. Let's see; should I get that new set of Jammin' Jay tires, or should I eat?

One day, while hanging out in front of my house, the kids from the 'hood were comparing lists to see who had the worst chores; then, it hit us. Hey! We could build our own track and avoid the hassle and expense of taking the bus to the track.

Fortunately, we live on the edge of town, and open fields border our backyards—a great place for a track. All we had to do was decide where to put the track. Right?

Wrong! As we were about to find out, it was a lot more involved than that. Read on, and learn what it takes to make a neighborhood track a reality.

GETTING PERMISSION

We all know that we should always ask permission before we use someone else's property. First, look around at a few prospective track sites. Make a list of the things that you could do for the property owner in return for the use of the land. You could offer to help with the upkeep of property by clearing the trash and the weeds. In my area, a field near our property has to be cleared of all brush every fall to reduce the possibility of fire. We worked out a deal with the owner of this field: in exchange for using her land, we agreed to clear the brush, which saved her \$500.

TRACK PLANNING 101

When the site had been approved, our group went into high gear with track ideas. After much discussion, it was agreed that everyone would design a track and that the best parts of each design would be incorporated into the raddest track this side of Mule's Butt, UT. We all found out quickly that designing a track was harder than we had thought.

(Continued on page 136)

ON-ROAD TRACKS

Corner dots, used to mark the track, can be made out of



To make corner dots for your track, you'll need plaster-patching material, a Frisbee and a can of non-stick cooking spray.

many things. We made some using a Frisbee as a mold and some plaster-patching goop that we bought at a hardware store. Mix the plaster according to the directions. Pour the plaster into the Frisbee, let it dry, flip the Frisbee over, and pop out the corner dot.

You can also use paper plates if you weight them down so that when you blast by they don't blow away. That will work for the corners, but what about the

straights? If you liked the sheet idea in the off-road hints, you can use that, or maybe you could find some old fire hose. The local fire station is a good place to start looking. If none of these is available, use a big piece of chalk to outline your track. I hope this will get you started on the way to many happy hours of R/Cing! Oh, by the way, stay away from those pesky concrete wheel stoppers and open storm drains!



Thoroughly coat the Frisbee with the nonstick cooking spray so the plaster-patching material won't stick to it.



Slowly pour the plaster-patching material into the Frisbee so that it doesn't splatter. Fill it to the top, smooth it out, and let it dry completely.



Once the material has dried, turn the Frisbee over, pop the dot out and paint it any color you want.



K Y O S H O *Following the* TRACK

by
Jonathan
Biebesheimer

LOOKING FOR a beginner's perspective? I was recently given the opportunity to build my first R/C truck—a 1/10-scale, electric, off-road Kyosho* Tracker. If you've wanted to build an R/C vehicle, but have never done so, I hope that this article will inspire you to take the plunge!

I clearly remember saying, "How many pieces could this thing possibly be in?" I got my shocking answer as soon as I pulled the top off the box and found bag after bag of little parts in all shapes and sizes. To my relief, I realized that there was some order to this box of chaos; everything was clearly labeled and numbered.

The Tracker was a fantastic place to start. Its ease of construction and great performance make it a good bet for anyone who's just getting into R/C.

CONSTRUCTION

As a beginner, I made my fair share of building mistakes. My curiosity and eagerness to finish the truck (which I was convinced I could do in under an hour!) made me plunge headlong into the project unprepared. I didn't get very far before I was all tangled up and frustrated. Looking back to page three of the instructions, I found all of the things I should have been doing. Of course, rule number one read: "Take your time, and read the instruction manual thoroughly." I was already 0 for 1. While I felt

according to the steps made the process much faster, and it cut down on the number of mistakes I made.

The instruction manual was clear and specific, and this also helped me on my way. Starting with the diff (the Tracker uses a gear diff) and working through the gearbox, I

completed the first stages of the car quickly. After the front and rear suspension arms had been put together, the car really began to take shape. The suspension was the only mechanical part of the car that really gave me trouble. For starters, a few pieces weren't molded quite right. Not knowing how tight or loose some of the parts were supposed to be, I gave it my best guess. I later conferred with an R/C pro and ended up dismantling part of the front suspension so that I could trim

a few pieces and fit them properly. It was my first car, and I was determined to make it perfect!

ELECTRICS

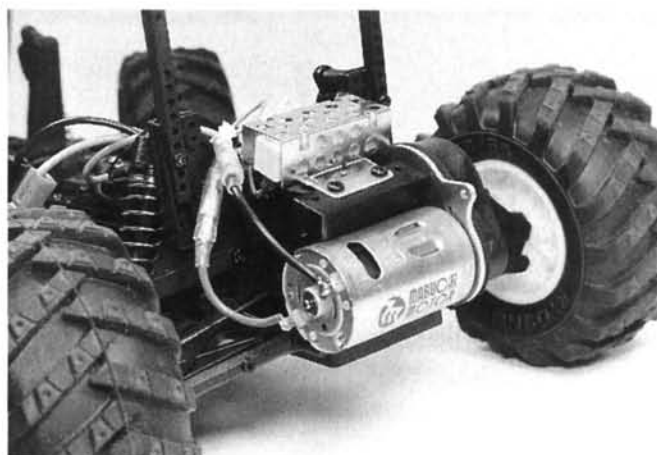
Near the end of the project, I ran into a brick wall when I discovered that I didn't have all the radio electronics I needed. Included in the Tracker kit were the motor and the mechanical speed controller, but not the servos, the receiver and the battery. Fingers crossed, I decided to build around these parts and put them in later. The Tracker's electrical setup was pretty basic, so it wasn't a problem to add the other parts. A 2-channel receiver, servos for steering and the speed controller were required.

The instructions called for the motor and the servos to draw off the same battery. While the servos don't use a lot of power, every little bit

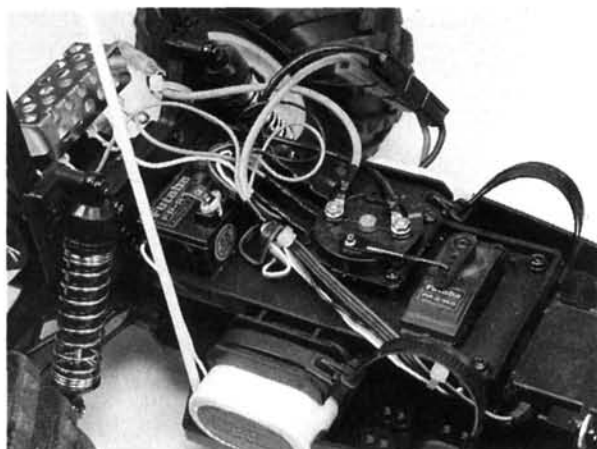
counts, especially with me, since I have only one battery! There is, however, plenty of space in the chassis to install a second small battery pack for the servos—a priority on my "to do" list.

TEST DRIVE

Even though this is an entry-level car, the most important thing is that it's a blast, right? Well, the Tracker definitely didn't disappoint me! Soon after completion and a quick lesson in R/C driving, I was screaming around at a local schoolyard. The truck handled everything very well—grass, dirt, bumps, pavement, sand, jumps, you name it! I really wanted to see what this machine could do. I was lucky to have reverse, though. Hey, I'm a beginner! I hit things, OK?



The Tracker comes with a Mabuchi 550 motor which, owing to its longer armature design, provides more torque than a standard 540. The gearbox is equipped with a gear differential—a desirable feature for novice drivers.



Two servos are needed to get the Tracker up and running—one for steering and one for operating the kit's mechanical speed controller.

foolish for being so reckless, I realized that learning the hard way was better than not learning at all. I reorganized my attack and

ER

proceeded with more care.

The best of the helpful tips (which is apparently an R/C veteran standard) was to use a muffin tin or an egg carton to separate screws, nuts and washers. My biggest problem was figuring out which screw went where, which size was which and when I should use what. Sorting the parts



The black plastic shocks that come with the kit are adequate, but make sure that you fill them with a semi-thick oil, such as 30WT.

Detailing the details

The killer for me was the body work. I recommend that you consult someone at a hobby shop or an experienced R/C builder before jumping off the ledge for the first time. There's definitely an art to the

body work and, unfortunately, the instructions aren't very helpful. Also, make sure you have a new hobby knife or sharp blades. This will make cutting out the body (and, later, the decals) a million times

easier, and the results will be considerably better.

I decided to attempt a two-tone body (white upper, black lower) with black windows and a flat-black bed. The hardest, most time-consuming part of the painting process was masking the appropriate areas carefully. Two-inch masking tape worked very well for the windows, and 1-inch did the trick for the other spots. My inexperience showed up again, though. After I had applied enough coats of white, I pulled the tape off the masked areas. It was then that I learned that if you paint a dark color (such as black) over a light color (in my case, white), the light color will appear darker! Oops. I was offered two solutions to my problem: the first (from a hobby-shop owner) was to mask the parts I had just painted. Not a chance! The second (from a friend) was to apply a layer or two of silver paint to keep the dark color from penetrating the light color. This, unfortunately, wasn't possible either, since I had already (like an idiot) pulled off the masking tape. My only solution was to apply a slightly lighter coat of black and hope for the best. Although the result was OK, I wished that I had done more research. I discovered that there's no shortage of people with good advice and tips on building R/C cars.

The final touches seemed easy compared with the painting. The assembly of the bumpers and the roll bar gave me no trouble at all. I was a little disappointed with the hood decal I had put on; I had pulled it off too many times because it either wasn't straight or there was an air bubble or speck of something underneath. The limit on pulling off a decal seems to be about twice before it loses its stick. A replacement pack of decals is available for less than \$10, and it's always an option if things go bad. Last, but not least, I added a touch of realism to the truck by painting the writing on the tire walls. I used white Testors* paint and tried a variety of applicators before I chose a tiny rectangular piece of sponge. Dabbing the sponge onto the raised letters minimized the amount of slop on the rest of the tire. I was told later that a cigarette actually works even better (preferably unused!).

TRACKER

Aside from being loads of fun, the first run was a great lesson in understanding how an R/C ticks. The truck uses a few things that I'd like to replace. At the top of the wish list is an electronic speed controller. The Tracker comes with a mechanical speed controller (three speeds plus reverse), which was easy to install. It gave me all sorts of problems, though. I was having trouble getting the truck into reverse, so I trimmed the radio to compensate. I ended up having to overcompensate, and after doing

so, the truck got stuck between second and third. After a short run, the truck stunk—literally! I traced the problem back to the resistor, which I had basically fried. There seemed to be no happy medium so that I'd get full speed ahead and a reverse that didn't stutter.

Aside from the ESC, I'd revamp some electronics, e.g., I'd install a second battery pack for the servos, a receiver switch (which I didn't originally install) and a slightly more convenient means of holding the battery. The Tracker uses tie-

KYOSHO TRACKER



Manufacturer.....Kyosho
TypeElectric off-road
Scale.....1/10
List Price.....\$169.99

DIMENSIONS

Overall length.....18.1 in.
Wheelbase.....10.8 in.
Front width.....11.6 in.
Rear width.....11.6 in.

WEIGHT

Gross (ready to run).....3.7 lb.

CHASSIS

Type.....Tub
Material.....Plastic

DRIVE TRAIN

Type.....Sealed gearbox
Transmission.....Gear
Differential(s).....Bevel gear
Slipper clutch.....None
Bushings.....Metal and plastic

SUSPENSION

Type (F/R).....Lower control arm
w/upper link
Damping (F/R).....Oil-filled,
.....coil-over shocks

WHEELS

F/R: Type.....One-piece plastic
Dimensions (DxW).....2.4x1.7 in.

TIRES

F/R.....Semi-pneumatic V-tread

ELECTRICS

Motor.....Mabuchi
.....RS-550 SH (included)
Battery.....Not included
Speed controller.....Mechanical

OPTIONS AS TESTED

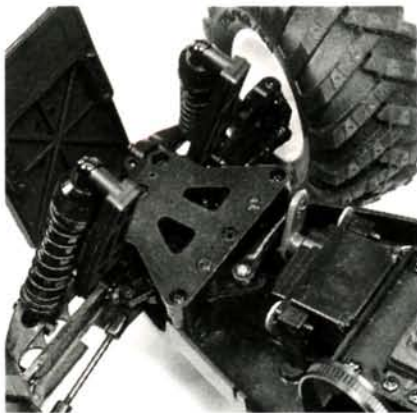
Futaba* Magnum Sport radio, S-148
throttle servo, Airtronics* 94102 steering
servo, Trinity* 1400mAh pack

HITS

• Clear instructions. • Uncomplicated construction. • Good overall performance on- and off-road.

MISSES

• Suspension is acceptable, but there's room for improvement.



To steer this beast, you'll need a steering servo that has some guts. An Airtronics 94102 servo with roughly 50 oz.-in. of torque works just fine.

wraps, which work fine; however, if you remove the battery a lot, the routine of taking the body off and dealing with the tie-wraps every time wears pretty thin. I'm determined to find (or custom build) a better way to "lock and load."

Last, I'd treat my truck to a shock overhaul. The shocks the Tracker came with are certainly acceptable; they're plastic and filled with a fairly lightweight oil. When I was building them, I couldn't see what the difference in oil would be, but as soon as I took the truck for a spin, I began to see the light. The truck bobbed a fair amount in the bumps, which made it lose control from time to time. Along with experimenting with oils with higher viscosity, several other adjustments are worth trying. I've read enough to realize that shock tuning is a very precise, rather confusing science, but ultimately, getting the correct shock adjustment can make all the difference in how a car handles.

All in all, the Tracker was a fantastic place to start. Its ease of construction and great performance make it a good bet for anyone who's just getting into R/C. With my confidence running high, I'm going to attempt some modifications and perhaps the gas conversion that Kyosho now has for the Tracker. Who knows? Maybe I'll even see you at the races!

*Here are the addresses of the companies mentioned in this article:
Kyosho/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.
Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.
Airtronics Inc., 11 Autry, Irvine, CA 92718; (704) 830-8769.
Trinity Products Inc., 1901 E. Linden Ave., # 8, Linden, NJ 07036; (908) 862-1705.
Testors Corp., 620 Buckbee St., Rockford, IL 61104.

QUICK!

Your car just died on the track. What do you do?



The old way: Run to track. Grab car. Run back to pit area. Attach glow plug starter. Plug in electric starter that's hooked up to 12V battery. Start engine. Run back to track with car.



The new improved KO way: Run to track. Plug new KO Propo EG Starter into car. Push button. Continue with race before your competitor is even out of the pit.

If you own the DuraTrax GT-10 or RC10T/LXT Conversion Kits, or Kyosho's Inferno 10 or Nitro Thrasher, starting your engine can be as easy as pushing a button.

KO Propo's new EG Starter System works like this: Bolt its on-board electric starter, featuring a compact gearbox and electric motor, onto the engine. Then just plug the system's hand-held starter unit into the connector harness and push the "start" button. It sends power to the glow plug and starter—and the engine starts instantly!



Before other racers are out of the pits, you'll slip the starter back on its handy belt clip and be back in action.

You can also use the EG Starter with scratch-built kits powered by an O.S. .10 FP or .12 CZ-R, or with Kyosho's Concept 10 helicopter.

And someday when you're showing off your trophies, you can tell your kids about the *old days*...before ni-starters and bulky electric starter boxes became a thing of the past.

KO PROPO

KONDO & CO., LTD.
Tokyo, Japan

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R/C DOCTOR

by DOUG MERTES

Cheap Chargin'

BET YOU THINK you have to spend megadollars on a peak-charger—right? If you're fairly new to the sport, or perhaps just a weekend warrior, you probably already have an AC/DC charger (such as a Pro-Tech*, AstroFlight*, or Five Star*) that has a mechanical timer; it charges your packs for about 15 minutes or so, and then goes to trickle-charge. You might feel that you never *really* know when your packs are fully charged. You might even have had the unfortunate experience of thinking that you had hit the charger timer again, only to discover, much to your chagrin, that you died 3 minutes into a 4-minute race. Or, even worse, you might have overcharged a battery pack and damaged it.

It doesn't have to happen, and you might not really *need* that hi-zoot charger. See, the charger you already

have works well enough; you just have to learn a few rules and adjust your charging technique. You'll be amazed at how much better your batteries and charger are than you *thought* they were!

When charging on the cheap,

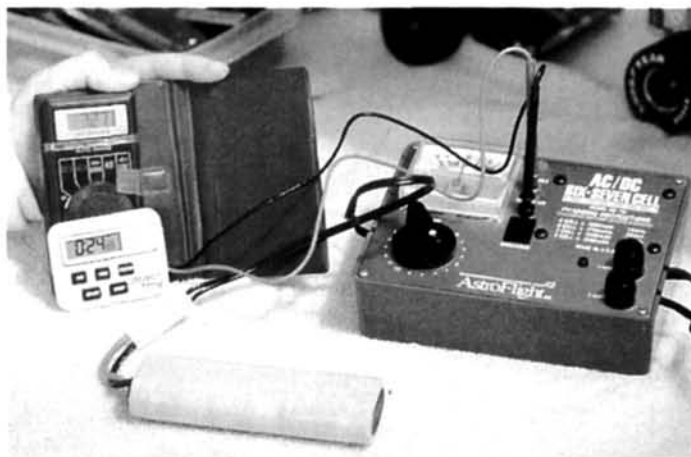
volts, crank the mechanical timer, and start charging your pack.

At the same time, start a stopwatch or a countdown timer so that you'll know how much total time elapses. If you have an adjustable-current charger, set it for about 4 to 5 amps (that's a safe range for any type of battery, so most non-adjustable chargers are set at that level at the factory). When the mechanical charger goes off, crank it around again, and start to watch the DVM.

You'll notice that the voltage displayed by the DVM rises *verrrrry slowwwwwly*. At about the 25-minute mark (for 1400 SCRs) or the 35-minute mark (for

1700 SCRCs), the numbers will stop rising and start to go back down. When the voltage has dropped .05 volt (now you know why you need a digital voltmeter!), the pack is peaked and ready to race. Do this once more before you put the car down (fully charged; it will only take a minute or two), and you'll get the absolute maximum out of your packs, no matter what their type, brand, age, or size.

You started the stopwatch or countdown timer so that you'd be able to record an exact charge time for the pack. Write this time on an adhesive label, and stick the label on the pack for future reference. If you always start with a discharged battery and always charge it at the same rate, it will always take about the same



Plug your DVM into the charger sockets, set the timer, and let 'er rip!

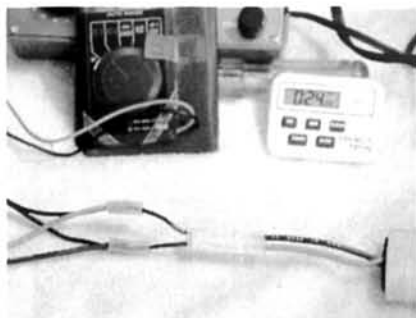
there are only two basic rules:

- Buy an electronic timer and an inexpensive digital voltmeter (DVM), and learn how to use them.
- Be consistent in the way in which you treat your batteries. Now, isn't that easy?

Start by making sure that your batteries are fully discharged and that they've had at least a night to rest and cool off. Now, using either the DVM sockets on the charger face or patch cords that clip on to your battery plug or leads (see photos), hook up the DVM, set it on DC



With a simple, inexpensive digital voltmeter, such as this one from Radio Shack, and an electronic timer, you can peak your batteries like a pro!



If your charger doesn't have DVM sockets, use patch cords like these to hook it up to your battery plug or leads.



When the numbers start to go down—bing! Your pack is fully charged. Note the elapsed time, and write it on the pack. Next time, no guesswork!



After the first go-around on the charger's mechanical timer, keep an eye on the DVM.

length of time. Pretty neat, huh?

This method also works well on what I call "weird cells"—those 2000 to 4400mAh cells that we Clodbuster owners love to run. It will take somewhat longer—around 40 minutes for 2000 SCs and about 90 minutes for 4400 SCs—but you'll find that these batteries respond in the same way: *maximum run time = maximum fun time!*

*Here are the addresses of the companies mentioned in this article:
Pro-Tech; distributed by Model Craft Mfg., 4555 W. Pico Blvd., Los Angeles, CA 90019.
AstroFlight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.
Five Star, 3640 Milwaukee St., Port Huron, MI 48060.

VIRTUOUS VENOM



Power Rev R/C Engine Treatment (SO-01) is the "after run" oil for all 2 and 4 cycle R/C engines. A few drops after a day of operation makes them run cooler, faster, and last much longer with less maintenance.

[VENOMOUS TIP: Use Engine Treatment along with Fuel Treatment for Max. RPM Performance!]



Power Rev R/C Fuel Treatment (SO-02) added to gas or glow R/C fuel renders "striking" improvements in any engine. Conditioning and stabilizing fuel to output higher RPM's, improve starting, idle and high speed operation, it also cleans and lubricates the entire fuel system.



Power Rev R/C 2-Cycle Oil (SO-06) mixes evenly with all types of gasoline to give the best gas/oil mix for your gasoline powered model engines. Improved protection from frictional heat and wear makes your engine run smoother, harder and longer.

[VENOMOUS TIP: Add in Power Rev R/C Fuel Treatment (SO-02) to your 2-Cycle gas/oil fuel mixture for even greater overall fuel performance!]



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Glide run smoother and quieter. Resistant to water, Power Glide grease is perfect for on and off road R/C cars and R/C model boats too.

[VENOMOUS TIP: Add a drop of Power Glide R/C Bearing Lubricant (SO-04) to all metal parts before applying grease for total, friction-free performance!]



Power Glide R/C Bearing Lubricant (SO-04) gets extra spin out of bearings, shafts and linkages. The repelling magic of SP-10 eliminates friction and penetrates, coats and lubricates metal surfaces.

[VENOMOUS TIP: Because it's water repellent, Power Glide R/C Bearing Lubricant is your best protection from rust and corrosion too!]



Power Glide R/C Spray Lubricant (SO-05) gives complete protection from friction in bushings, bearings, shafts, ball-links and any contacting metal surfaces. A quick blast on electric motor bearings boosts power immediately and gives protection for an entire race!

[VENOMOUS TIP: Apply a drop of Power Glide R/C Bearing Lubricant (SO-04) after spraying the part with Power Glide R/C Spray Lubricant!]



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SCOPING OUT

NOVAK 410-M1c

by JOHN RIST

I'M ALWAYS amazed when an ESC manufacturer makes improvements to a product that already seems to be highly refined. Novak*, for example, has updated its compact, light 410-M1c—a forward-only with brake, racing-style speed controller, which impressed me when I first reviewed it in September '91.

MANUFACTURER'S CLAIMS

How much has the 410-M1c been improved? Its new features include:

- solid-state reverse-voltage protection;
- heavy-duty BEC (6 volts/1 amp);
- more powerful braking;
- easier-to-use current limiter.

It always had:

- seven FETs: five for forward and two for brakes;
- massive 12-gauge three-wire setup for low resistance;
- high-frequency motor control;
- electronic thermal-overload protection;

Of course, Novak includes full instructions, decals, battery-to-motor wire, a screwdriver, hole plugs, a heat sink and the Novak universal receiver-plug system. Pretty impressive!

SNOOP FOR THE SCOOP

To open the 410-M1c's case, simply remove four screws; the halves are joined by a deep lip-and-groove overlap. The FET exit holes are sealed with a rubber gasket, and there are adjustment-hole plugs, so we shouldn't have too much trouble keeping out the dirt (we all love to race in the stuff).

Inside, there are two stacked printed-circuit boards covered with a host of surface-mounted components. Novak has done a super job of stuffing a multitude of functions into a really small package—21st-

century high tech.

The instruction book is thorough and has good drawings that show the 410-MXc (which is no longer available) instead of the 410-M1c. They have the same general features, though, so I didn't find this confusing, and there are a couple of extra sheets on the new and improved features.

WILL IT TEST WITH THE BEST?

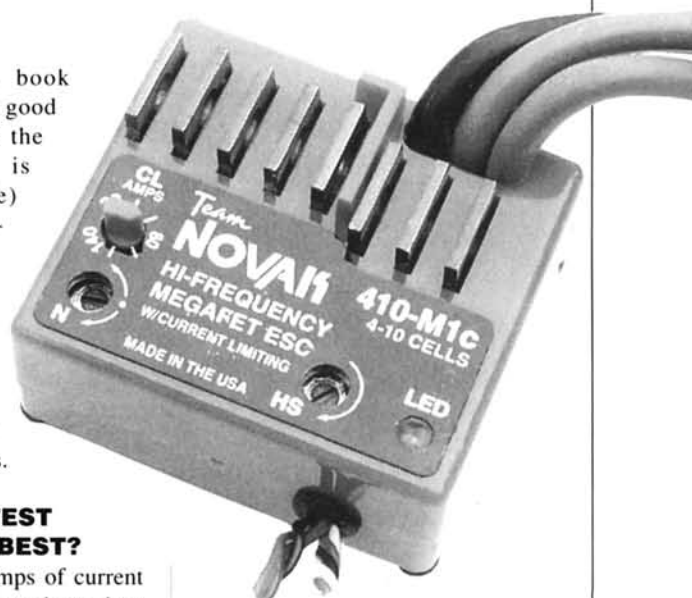
• **Test 1.** With 12 amps of current flowing, I measure the voltage drop across the ESC and then calculate its "on" resistance by dividing the measured voltage drop by 12. I measure resistance twice—along the full length of the motor wires and battery wires (including connectors) and 2 inches along them. The first reading helps me to determine an ESC's "on" resistance as it comes from the factory, and the second gives a standard reading with which I compare ESCs.

—End-to-end voltage drop: 0.07 volt—a resistance of 0.0058 ohm.

—Voltage drop 2 inches along the wire: 0.05 volt—a resistance of 0.0041 ohm.

These readings put the 410-M1c right up there with the best—true world-class, low "on" resistance.

• **Test 2.** I "cook" every controller I test by adjusting the resistor bank to pass 20 amps of current, jamming the throttle wide open and running the ESC for 15 minutes without any air cooling. This time, I jacked the current up to 21 amps. I installed the supplied heat sink because it was hard to tell where Novak had put the heat-sensing ele-



ment. (Heat sinks distribute heat evenly, so the thermal shut-down will work no matter where the heat sensor is.)

After 15 minutes, a check of the heat sink revealed that the controller was just a little warm—no surprise, considering its very low "on" resistance. If you install it where it will receive cooling air and you use the provided heat sink, the 410-M1c will handle hot modified motors with ease.

• **Test 3.** Finally, in my dead-short test, I check to see whether an ESC could survive the heavy current it would have to withstand if a gear jammed or the motor fried. For this, I clip a piece of monster wire with two alligator clips right across the motor wires, and the current jumps to 40 amps (the limit of my power supply). A 1700mAh battery pack will deliver 40 amps for only 2.4 minutes.

The 410-M1c will be able to take a lot of abuse, including a burnt-up motor and jammed gears, but if you ever suspect a problem, stop your car and check it, because the power

from a modern Ni-Cd battery pack could destroy your expensive equipment.

NEW TEST BED!

Right now, the hottest item in the Rist racing stable is the RC10 Team car, which is equipped with a Slot Machine motor powered by a 6-cell Sanyo 1400mAh pack. The 410-M1c is small, and that made it very easy to fit in the place of the controller I removed.

The wires exit the top of the controller instead of the side, so I was able to keep them short and still have them reach the battery pack. I use Litespeed* connectors to connect my batteries and my speed controller. They minimize power loss, and the price is right. I do, however, hard-wire the motor. This isn't a handicap; between races, I just let the motor dangle on the end of its wires for cleaning.

The 410-M1c has three wires, so you have to run an extra red wire from the battery to the motor. It's almost impossible to get two monster wires into the contact of a Litespeed connector, so I removed about three-quarters of the strands from the end of the red controller wire, and I removed a quarter of the strands from the end of the red battery-to-motor wire. I then twisted these wires together, inserted them

in the contact and soldered them. After that, I inserted the contact (with difficulty) and wires into the red connector shell. The object is to get the juice to the motor; the controller uses very little current, and only the red battery-to-motor wire and the black and blue wires carry heavy current.

NOVAK 410-M1c

DIMENSIONS

Height 0.80 in.
Width 1.46 in.
Length 1.61 in.
Weight (with wires) 2.4 oz.

TUNING

Access to controls Very good
Ease of adjustment Excellent

LIST PRICE/WARRANTY ..\$160/90 days

Electrical (manufacturer's specs)

Max. voltage 10 cells
Min. voltage 4 cells

Continuous current 250 amps
Resistance 0.0030 ohm

TEST PARAMETERS

Voltage 6 volts
Current 12 amps

Voltage drop

—along full length of wires 0.07 volt
—2 in. along wires 0.05 volt

Resistance

—along full length of wires 0.0058 ohm
—2 in. along wires 0.0041 ohm

BEC voltage, 6-cell pack 6.1 volts

Resistance = voltage drop/current

Comments: the 410-M1c has a very low "on" resistance that should allow it to handle modified motors easily. Its high current-handling capability is the result of efficient design, expensive FETs and very large motor and battery wires. Its output frequency switches at 2500Hz instead of the usual 60Hz. This HF output reduces armature wear, increases run times, reduces motor heating and provides smoothness and control in the low to mid-throttle ranges. Braking action is strong. The current limiter is easy to adjust; its range is wide enough to allow you to match your acceleration to almost any track. The 410-M1c has been and will continue to be a winning force in stock and modified racing everywhere.

ON TRACK?

With the new Novak ESC installed and my batteries charged, I headed for the local off-road track. As soon as I put the pedal to the metal, it was obvious that this controller has what it takes to march you right into the winners' circle.

If you've never driven a HF

ADVANTAGES OF HF CONTROL

To understand the advantages of high-frequency (HF) motor control, you have to know how an ESC works. When run at half throttle, the ESC is switching on and off at a 50-percent-duty cycle—turned on half the time and off half the time. In ESCs with standard switching, this on/off procedure happens 60 times a second (60Hz). This 60Hz represents the rate at which the transmitter updates the throttle and steering information. The simplest design lets the ESC switch at the transmitter's update speed.

Unfortunately, a slow switching rate causes motor heating and brush arcing and sparking (which fry the brushes and comm). High-speed switching is the solution, and Novak settled on a frequency of 2500Hz—a frequency that also ensures smooth throttle response. When your motor turns at 7,000rpm, the armature is revolving at approximately 116.7 times a second. If your ESC rate is 60 times a second, the motor makes almost two revolutions in the time it takes the controller to switch.

When you run a standard ESC slowly, you'll hear the 60Hz growl in the motor. When the controller is running at 2500Hz, it's switching faster than the motor is turning. If you have an HF ESC, you'll hear a high-pitched whine when you squeeze the throttle trigger.

My previous example of a motor turning at 7,000rpm finds a HF controller switching 21.4 times per revolution. This means *smooth* operation. The first time you use an HF controller, you'll be amazed at the precise control that's available at slower speeds.

Perhaps the most significant advantage of HF control is that it causes less motor heating. The permanent magnet motors we use are designed to run on DC battery power. The AC generated by the ESC's switching action can't produce usable power in a DC motor. This AC is wasted as motor heat. The inductance of the motor, combined with the high frequency, greatly reduces the effect of the alternating current (AC) component that's present in the normal motor-drive circuit.

Energy from the battery is either converted to "go" energy or heat energy. Reduce the effect of the AC component, and you'll reduce heating and increase run times and motor life. Keep in mind if you run wide open, such as in high-bank, high-speed oval racing, any controller will work well for you because, at full throttle, a controller comes on hard, and all switching action stops. Realistically, most of us get into trouble, even on a high-speed oval. The smoothness of a HF ESC is the ticket for a fast recovery from trouble.

ESC, jump at the first chance you get to try one. It offers longer run times; it reduces wear and tear on the brushes and comm; and it keeps your motor running cooler. But I think the biggest advantage is smoothness; even during the holeshot off the line, this ESC's smooth operation prevents wheel spin, and it also makes it easy to negotiate the turns and jumps.

All the run times were good (4 minutes plus, with fairly high gearing), and checking the heat sinks after each run verified this ESC's really low "on" resistance. (The heat sinks were never more than slightly warm.)

How about Novak's claims for the brakes? During 180-degree, sliding, stop-and-go turns, they worked flawlessly. They were very controllable—the type of control you need on a difficult roadcourse.

The new calibrated current-limiting knob makes it easy to set any current limit you want. First, I tried the minimum (20 amps); the car was definitely sluggish. At the halfway point (80 amps), the car behaved normally (acceleration might have been down just a little). Overall, the feature works very well. If you race on slippery off-road tracks, you'll be able to fine-tune this controller to obtain punch out of the corners without limiting top speed. Current levels are conveniently printed around the knob; just record the reading and the condition of the track. Use this information as a starting point the next time you run under similar conditions.

I definitely enjoyed testing this controller; it worked flawlessly, and it has world-class low "on" resistance, strong braking action and all the advantages of HF motor control. It will handle modified motors with ease. Its current-limiting circuit has a wide range, so you'll be able to match your acceleration to almost any track. If you're a serious racer—stock or modified—check out the 410-M1c; it could mean a win for you.

*Here are the addresses of the companies mentioned in this article:
Novak Electronics Inc., 18910 Teller Ave., Irvine, CA 92715; (714) 549-0875.
Litespeed, P.O. Box 4765, Spokane, WA 99202; (509) 335-2717.

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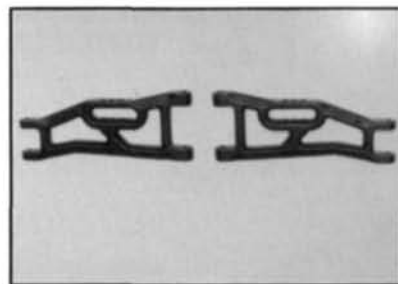
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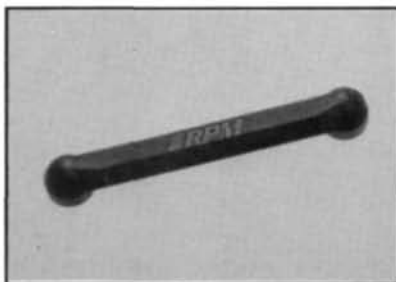
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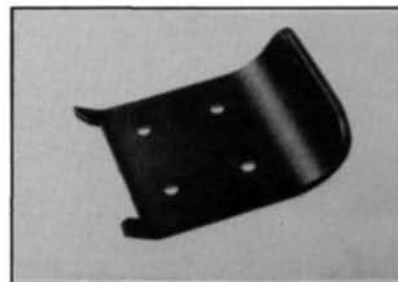
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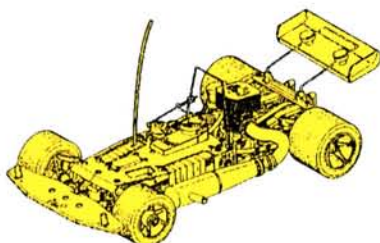
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ASSOCIATED RC10GT

(Continued from page 33)

the low-end needle valve. It's buried so deep in the side of the carb that it's very difficult to adjust once the truck has been assembled.

TESTING

Unfortunately, the ground in the Northeast was covered with ice and snow when I was ready to test the GT, so I took it out on the street. Tuning the engine took a while, but it ran very well after it had been dialed. The brakes worked well when I got the new disk; they stopped the truck in a couple of feet. As for the handling, it's identical to that of its electric brother. I suggest that you build the shocks just as the manual tells you; they work well!

If you've been thinking about trying a gas-truck kit, but you've been scared by the con-

versions, your worries are over! Now you can get all the goodies in one box from a company that has more than 20 years of gas-racing experience. This is the next generation of racing!

**Here are the addresses of the companies mentioned in this article:*

Associated Electric, 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9342.

Yokomo Ltd., 25-2, Senju-Motomachi, Adachi-Ku, Tokyo 120, Japan.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.

SCI Corp. of America, P.O. Box 13099, Sarasota, FL 34278. ■

10 EASY TRACK LAYOUTS

(Continued from page 110)

The first thing we had to do was measure the land. One way to do this is to pace off the area. Once you know how many steps it

takes to walk the land, all you have to do is measure your stride. (Most steps are in the 2- to 3-foot range.) Take the number of steps, and multiply by the length of your stride. (I knew math would come in handy one day!)

Try to design a track that takes advantage of the natural terrain. Avoid using trash, such as old couches or anything else that critters might want to call home, for jumps. If at all possible, use dirt to build your jumps, not wood or metal. This will make it easier to redesign the track if you become bored with it, or if your skill level surpasses the design. Whichever method you choose, making your own track is a simple cost-saving way to get more enjoyment from your R/C vehicle. ■

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Tire Durometer

LETTERS

(Continued from page 9)

F1 FYI

I enjoy getting your magazine every month. I have a million questions about the Kyosho F1 1/10 scale. After buying the car and reading about the Jordan Yamaha in your June '93 issue, I'm having problems with the car's traction under hard acceleration from a standing start. Is this normal? Guys I race with seem to think that the front suspension is too delicate and that I'll have to replace parts often. Also, does anyone make BBS rims that will fit my car, or do I have to order more rims and foam tires from Kyosho? I'm new to on-road, and I need all the help I can get. Thanks.

DANNY CARR
Manassas, VA

Well, Danny, I talked to our resident parking lot racer and contributor, the R/C Doctor, Doug Mertes, and he suggested that you start with a 20-tooth pinion gear and move up or down from there, depending on the run time you get.

The kit's tires are green dots, so if you still need more traction, go to green/yellow or yellow-dot tires. DuraTrax and HPI both sell rated F1 foam donuts. You could try the new, very sticky Tire Cap Rubber (no. FJW9) now available from Kyosho; it's glued over the foam tread areas. Don't use traction compound when running on pavement; it will just make your tires greasy and unhappy.

Or, loosen the rear screw that attaches the T-bar to the chassis about a quarter turn at a time, but don't let it get floppy.

As far as the front suspension is concerned, it's more durable than it looks, and it's pretty well protected by the front bumper.

If you really want to use BBS-type rims on your F1 car, you'll have to convert to 1/10-scale pan-car spindles and axles. See the article "F1 Surgery" (R/C Car Action, February '94) for a more detailed explanation.

JH



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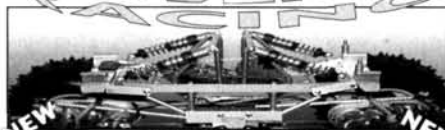
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